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Notes on Expansion of Steam and Hot Water Pipes

With Charts Covering Practice on High-Pressure Steam Mains and Hot Water Piping

By A. Lewis

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(From a paper read before the Victorian Institute of Engineers.)

EXPANSION in steam and hot water piping is still largely dealt with by rule-of-thumb methods, and provision for taking up such expansion varies very considerably. Instances are frequently met with where no allowance is made for expansion, and pipes bend like tame snakes between restrained points.

To minimize calculations, charts have been prepared from which the amount of expansion or elongation for various lengths of pipe and temperatures can be ascertained, together with the allowable deflection for various lengths and diameters of piping.

DATA FOR HIGH-PRESSURE STEAM MAINS

Fig. 1. is intended for use on high-pressure steam mains and covers a range of expansion for temperature differences from 50° F. and 650° F., while the curves of deflection for pipe diameters of 1 in. to 15 in. are based on a permissible fibre stress in pipe line of 12,000 lbs. per square inch.

CHART COVERING PRACTICE IN WATER HEATING

Fig. 2. is a similar chart covering practice in water heating, with temperatures varying from 160° to 240°, with an air temperature of 40° F. and with allowable fibre stress in pipe material of 16,000 lbs. per square inch.

HOW TO USE THE CHARTS

The use of the charts is best demonstrated by examples.

Example 1. Find the amount of expansion or elongation in a 1 in. pipe line 100 ft. long subject to an internal temperature of 180° F. and an external temperature of 40° F.

From Fig. 2. The expansion for a temperature of 180° F. and a length of 20 ft. is 0.22 in.; for 100 ft., the expansion is $0.22 \times 5 = 1.1$ in.

Example 2. The hot water pipe, shown diagrammatically in Fig. 3, is 1 in. in diameter and is anchored on one leg at 5 ft. from bend. What is the the safe permissible deflection in this leg?

In Fig. 3 the full line indicates the hot water pipe in its mid-position. When cold, it will follow the inside dotted line, and, when heated, will follow the outside dotted line. In allowing for expansion during erection, steam and hot water pipes are usually strained an amount equal to half of the calculated expansion. Thus, in a pipe heated to half the temperature range, the expansion would relieve the mechanical strain set up, and further heating from half to full temperature range strains the pipe.

In Example 2, a 1-in. pipe 5 ft. long can be strained 0.95 in. and if pipe is strained when cold 0.95 in. a total expansion of $0.95 \times 2 = 1.9$ in. can

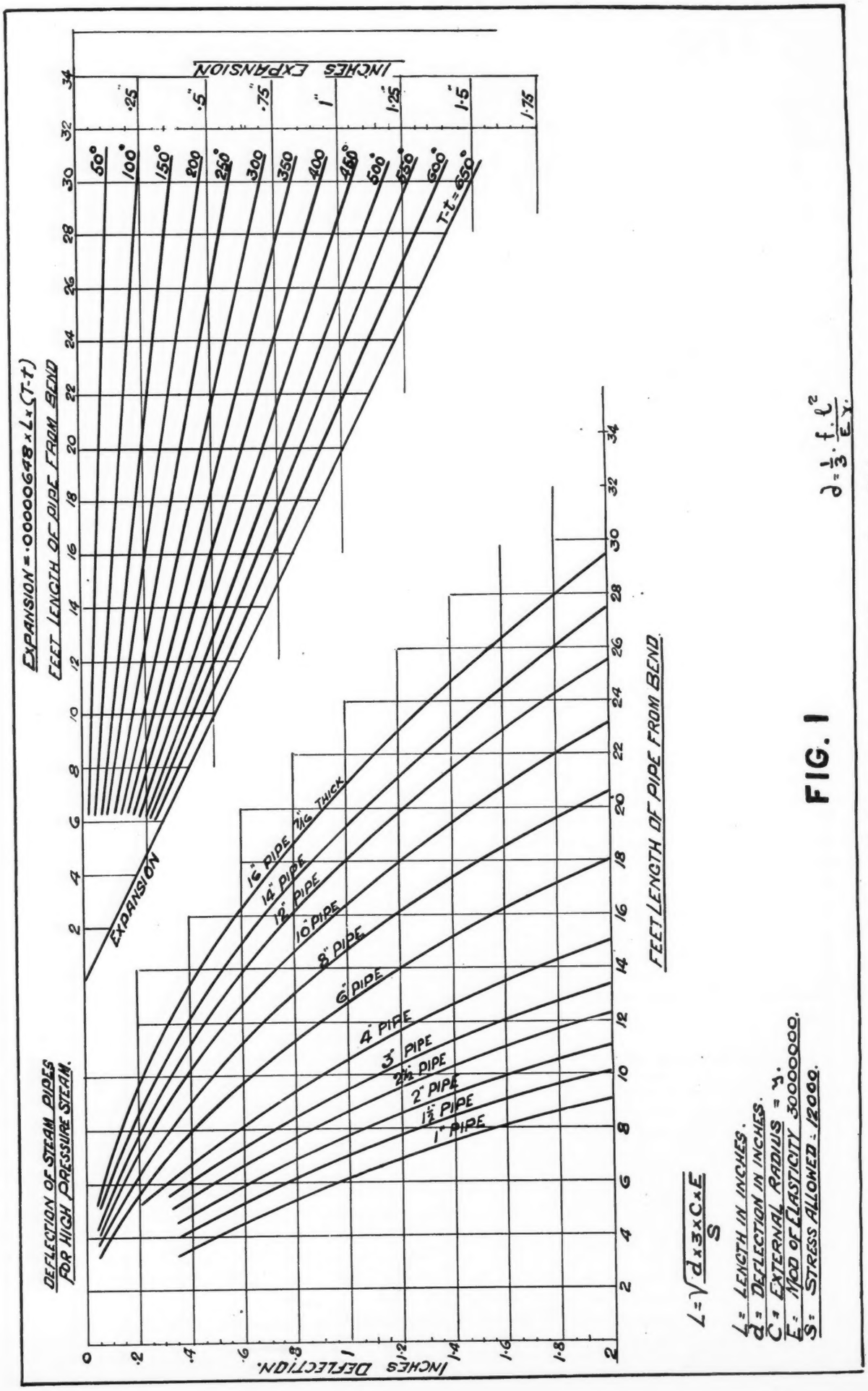

Fig. 1. Pipe Expansion Chart for High-Pressure Steam Mains

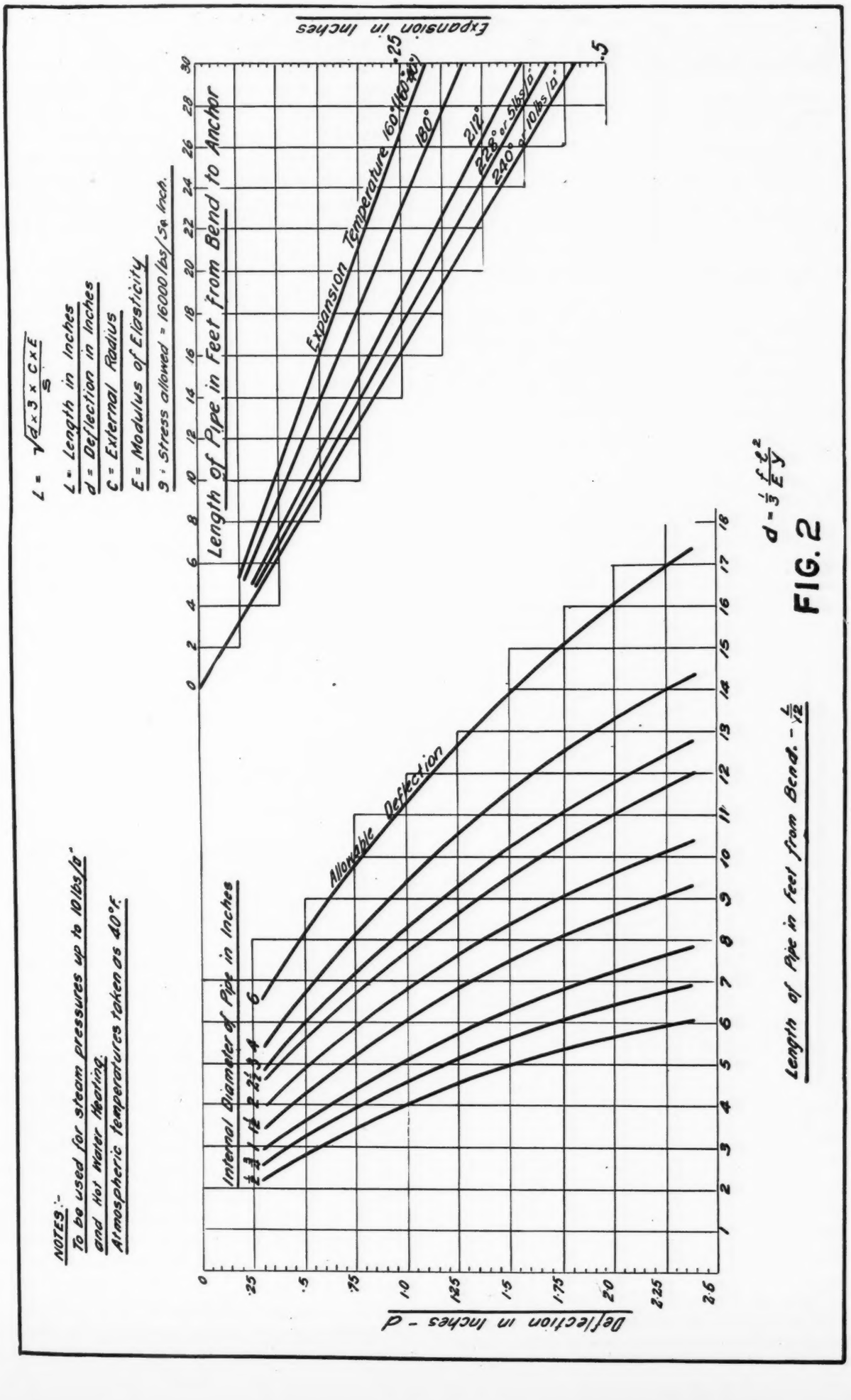
L = √(d × 3 × C × E / S)
L = Length in Inches
d = Deflection in Inches
C = External Radius
E = Modulus of Elasticity
S = Stress allowed = 16000 lbs/sq inch.
NOTES:-
To be used for steam pressures up to 10 lbs/sq"
and Hot Water Heating.
Atmospheric temperatures taken as 40°F.
Expansion in Inches
Length of Pipe in Feet from Bend to Anchor
Expansion Temperature 160°(140°+40°)
180°
212°
228° or 5 lbs/sq"
240° or 10 lbs/sq"
Internal Diameter of Pipe in Inches
Allowable Deflection
Deflection in Inches - d
Length of Pipe in feet from Bend. - L
d = 1/3 f L² / E y
FIG. 2

Fig. 2. Pipe Expansion Chart for Low-Pressure Steam and Hot Water Piping

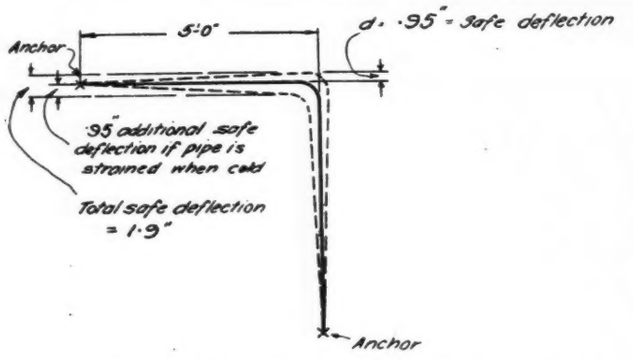
Anchor
5'-0"
d = .95" = safe deflection
.95" additional safe deflection if pipe is strained when cold
Total safe deflection = 1.9"
Anchor

Fig. 3. Hot Water Pipe Connection Used in Example 2

be safely taken care of by the 5-ft. horizontal leg. Thus, the length of the vertical leg from bend to anchor can be such that expansion is 1.9 in. and if the temperature is 180° F., 20 ft. will expand 0.22 in. and length of vertical leg will be

$$\frac{1.9}{0.22} \times 20 = 173 \text{ ft.}$$

Example 3. Find expansion in a drop pipe 100 ft. long at 212° F. From Fig. 2, expansion is 1.34 in. Half of this amount is to be provided for by straining pipe when cold, leaving 0.67 in. movement to be provided for in expansion length.

This represents a typical case of drop pipe in the heating system of a tall city building and there are three methods by which expansion can be provided for.

Fig. 4 shows one method in which pipes are offset at radiator tappings on each of eight floors. Each length, L, would have to provide for a movement of $\frac{0.67}{8 \times 2} = 0.042$ in. and if pipe is ¾ in. dia. L would require to be not less than 18 in., as shown in Fig. 5.

In an alternative method, the drop pipe could be straight and the branches to the radiators could be lengthened to take care of half the movement of the vertical leg, and the connections of riser to top and bottom rings would require to be free to move a similar amount. Thus, if ring mains top and bottom are 3 in. in diameter, then supports should be clear of riser not less than 5 ft. each side.

In a further alternative, connections to radiators could be as in second alternative ring mains top and bottom carried away from wall sufficiently to allow for free movement in the horizontal legs of riser which would require to be 3 ft. long.

If stresses are allowed in piping higher than are shown in diagrams, leaking threads and connections will occur. In Diagram 3, the maximum stress in pipes will occur near or at the anchors,

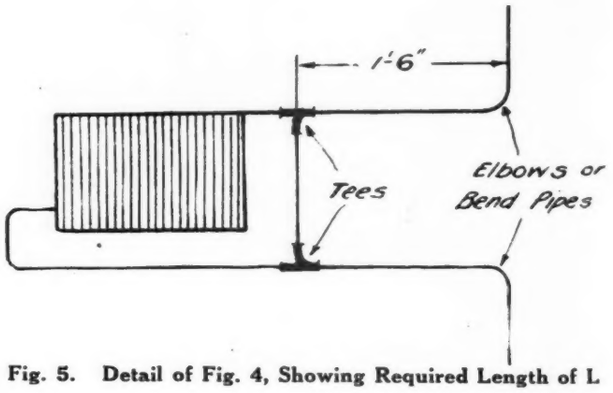

Fig. 5. Detail of Fig. 4, Showing Required Length of L

and sockets of screwings reducing the strength of pipe should be located as far as possible from anchors.

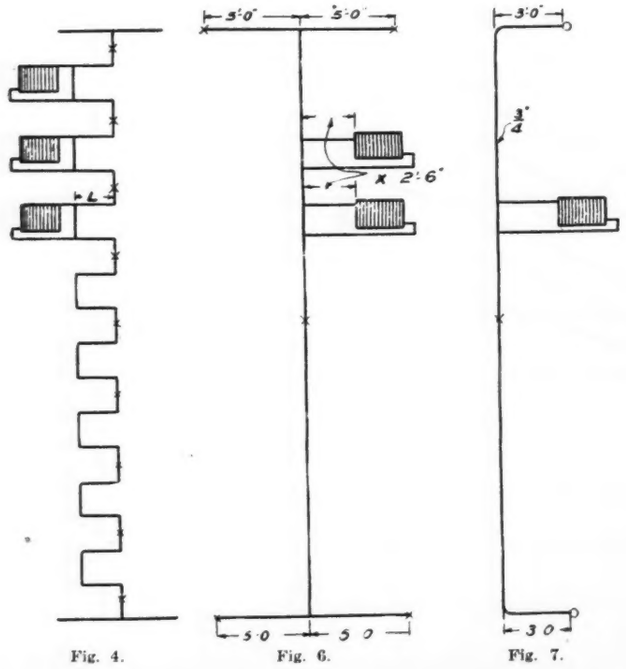

Fig. 4. Fig. 6. Fig. 7.

Three Methods of Providing for Expansion in Drop Piping in Eight-Story Building

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In the discussion following the presentation of Mr. Lewis's paper, it was brought out that in calculating stresses in steam pipes subject to frequent variations in temperatures of a wide range, allowance has to be made for the internal growth of the metal, caused by molecular arrangement, which is corrected by annealing at frequent intervals, in the case of copper pipe, and is covered in steel pipes, by a reduction in the allowable fibre stress.

In low-pressure steam and hot water installations, operating at temperatures not exceeding 250° F., a limiting stress of 16,000 lbs. per square inch is permissible, while for higher pressures the limit allowable is 12,000 lbs. per square inch. This might be considered low when compared with the 17,000 lbs. usually allowed in structures, but having regard to the risks involved, the figure has generally been accepted.

The Argument For Low-Pressure Heating Plants

A Comparison of High- Versus Low-Pressure Systems and a Description of Typical Heating Installations in Minneapolis Public Schools

II.

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(From a paper presented at the annual meeting of the National Association of Public School Officials in Toronto, Ont., May, 1926.)

As described in the first section of this article, published last month, the steam distributing system in typical Minneapolis public school heating plants is designed so that steam from the boiler nozzles enters a header constructed of 16-in. O.D. pipe, with welded necks and flanges for all openings. This eliminates all trouble from gaseous leaks, which are so common to headers made up of flange fittings and nipples, and the cost is much reduced. This header serves as an auxiliary steam reservoir.

From the header, the main steam supply to the house is carried directly to the attic space where it branches out and supplies all down-feed risers. Steam piping for gymnasiums, auditoriums, office suites and toilets is taken separately from the header so that these portions can be separately heated in evenings and on Sundays, as may be required.

Separate steam connections are also made to the header for supplying steam to blast coils, hot-water tanks, greenhouse, kitchen equipment, etc.

All lines are separately valved at the header, and all valves can be operated by the engineer from a platform reached by a ship's ladder from the boiler room floor.

RADIATION

Radiators are installed throughout the building of sizes sufficient to offset the heat loss from the various rooms. No allowance is made for air change as this is considered in designing the ventilating equipment. Radiators are hung on walls under windows on adjustable hangers which give a fixed space of 2½ in. between radiator and walls. In class rooms and offices, radiator shields of special design are provided to shield the children from radiant heat. These are located so as to provide a clear space of 2½ in. between the front of the radiator and the shield. This spacing of 2½ in. in front and back of radiators has proven to be the best for maximum efficiency of radiation.

BOILER-FEED AND VACUUM PUMPS

Electric-driven pumps are installed to return water of condensation from radiators to boilers. Wherever possible, the water returns to the pump by gravity, thus avoiding lift fittings. When this can be done, the pump is usually operated for a short time in starting up the plant in early morning and, after that, the returns go back directly to the boiler by gravity, thus saving electric power.

VENTILATING EQUIPMENT

All ventilation is accomplished by electric-driven fan equipment, either through a central fan system of ventilation or by individual class room units. Separate fans are provided for lunch room exhaust, cooking room exhaust, toilet room exhaust, gymnasium ventilation, and auditorium ventilation. All incoming air is washed and warmed and properly conditioned before delivery to the building.

Comparison of Coal and Electric Power Cost

CENTRAL HIGH SCHOOL AND ROOSEVELT HIGH SCHOOL

Central High School is the last high school building built in Minneapolis having a high-pressure system, including water-tube boilers, stokers, feedwater heaters, and engine-driven equipment. Roosevelt High School is the first high school building built in Minneapolis having a low-pressure system. The following table will give the comparative facts:—

	Central	*Roosevelt*
Year built	1913	1922
Contents, cubic feet	3,989,500	3,313,803
Number of pupils enrolled	2,306	2,677
Number of years for which averages are made	12	4
Maximum coal tonnage	2,446	1,172
Minimum coal tonnage	1,759	982
Average coal tonnage	2,158	1,103
Cost of coal per ton	$5.50	$7.00
Kind of coal used	Screenings	Franklin Co. 3 x 2
Average annual cost of coal	$11,869.00	$7,721.00
Cost of coal per cubic foot	$0.00298	$0.002329
Pounds of coal per cubic foot	1.083	.665

Average cost of electric power.....	.....	$1052.30
Total cost	$11,869.00	$8,773.30
Cost per cubic foot.....	$0.00298	$0.00265
Percentage saving in favor of low-pressure plant	.....	12.50%

COMPARISON OF LOWRY GRADE SCHOOL AND THE ERICSSON GRADE SCHOOL

The Thomas Lowry Grade School was the last grade School erected in Minneapolis having a high-pressure boiler plant and engine-driven fans and pumps, and which has had no additions. The John Ericsson Grade School was the first low-pressure boiler plant installed in Minneapolis Public Schools. The following table will give comparative facts:—

	Lowry	*Ericsson*
Year built	1915	1916
Contents, cubic feet.....	741,00	585,700
Number of pupils enrolled.....	755	695
Number of years for which averages are made.....	11	10
Maximum coal tonnage.....	299	192
Minimum coal tonnage.....	205	92
Average coal tonnage.....	263	136
Kind of coal used.....	Yough. D.R.	Yough. D.R.
Cost of coal per ton.....	$7.00	$7.00
Average annual cost of coal.....	$1841.00	$952.00
Pounds of coal per cubic foot....	.71	.464
Cost of coal per cubic foot.....	$0.00249	$0.001625
Average cost of electric power...	.....	$52.31
Total cost	$1841.00	$1004.31
Cost per cubic foot.....	$0.00249	$0.001714
Percentage saving in favor of low-pressure plant	.....	45.4%

COMPARISON OF BARTON, CALHOUN, CLINTON AND KENWOOD SCHOOLS

The Clara Barton, Clinton, Calhoun and Kenwood Schools were originally built with high-pressure plants, but when additions were made to these buildings the plants were changed over to low pressure.

65 of our 100 plants are low-pressure and more are being changed over as rapidly as we can get to them.

Proper Gage To Prevent Collapse Of Sheet Metal Exhaust Ducts

VENTILATING pipes of sheet metal are liable to distortion or collapse under certain conditions, especially when used to exhaust smoke from long tunnels, at which time the pressure in the pipe is negative or below that of the atmosphere. This negative pressure increases in the direction of the fan.

Some recent tests were made in order to determine how strong such pipes must be in order to prevent visible distortion as well as collapse. Results obtained are given in the following table as made on galvanized-iron pipes, constructed with rolled seams, for gages Nos. 18 to 22 and with sections riveted and soldered for gages Nos. 14 and 16.

Diam. In.	Gage U.S. Std.	*Pressure at which Noticeable Distortion Occurred	Pressure at which Collapse Occurred Lbs. Per Sq. In.
12	22	1.0	3.0
12	20	1.0	3.5
12	18	2.5	7.5
15	20	1.5	3.0
15	18	2.5	4.5
15	16	3.0	7.5
15	14	6.0	**10.0

The pipes collapsed in the center, after which they could be flattened by a differential pressure of much less than that needed to collapse them. From a study of the table it appears desirable in the design of such work to use a factor of safety of three, as distortion of the pipes causes the soldered seams to break and the pipe leaks.

Once a pipe is distorted it cannot be made to resume its former shape by the use of compressed air and though suitable for blowing would be useless for exhausting. (Walter S. Weeks, University of California, in *Engineering and Mining Journal-Press*, March 27, 1926.)

*Pressures below atmospheric pressure in pounds per square inch.
**Uncollapsed at 10.0.

Comparative Data on High-Pressure and Low-Pressure Operation for Four Minneapolis Schools

	CLARA BARTON SCHOOL		CLINTON SCHOOL		CALHOUN SCHOOL		KENWOOD SCHOOL	
	High-Press.	Low-Press.	High-Press.	Low-Press.	High-Press.	Low-Press.	High-Press.	Low-Press.
Year placed in operation.....	1915	1923	1889	1921	1887	1920	1908	1924
Contents, cu. ft.....	518,100	796,302	443,600	810,030	597,700	1,154,780	465,200	686,464
Number of years for which averages are made.....	8	3	7	5	6	6	10	2
Maximum coal tonnage.....	216	211	138	209	296	370	197	215
Minimum coal tonnage.....	135	200	119	159	218	222	127	179
Average coal tonnage.....	163	206	131	181	249	291	176	197
Kind of coal used.....	Yough. D.R.	Yough. D.R.	Yough. D.R.	Yough D.R.	Yough D.R.	Yough D.R.	Yough D.R.	Yough D.R.
Cost of coal per ton.....	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00	$7.00
Average annual cost of coal.....	$1141.00	$1442.00	$917.00	$1267.00	$1743.00	$2037.00	$1232.00	$1379.00
Pounds of coal per cu. ft.....	.629	.517	.590	.446	.833	.504	.756	.574
Cost of coal per cu. ft.....	$0.002202	$0.00181	$0.002067	$0.001565	$0.002916	$0.001766	$0.002648	$0.002010
Average cost of electric power...	.....	$251.50	.....	$114.66	.....	$382.00	.....	124.61
Total cost	$1141.00	$1693.50	$917.00	$1381.66	$1743.00	$2419.00	$1232.00	$1503.61
Cost per cu. ft.....	$0.002202	$0.002125	$0.002067	$0.001704	$0.002916	$0.002094	$0.002648	$0.002190
Percentage savings in favor of low-pressure plant		3.6%		17.3%		39.3%		20.9%

Coal Cost, 1924 and 1925—All Schools

	1924	*1925*
Coal tonnage	32,044	32,034
Cost	$214,730.86	$234,548.57
Average cost per ton.....	6.701	7.322
Cubic contents of building, cubic feet	91,688.222	93,729.828
Average cost of coal per cubic foot*	0.0023	0.0025

*The average for the United States is above 0.003 per cubic foot.

CONCLUSION

Minneapolis is so well sold on low-pressure boiler plans from a dollars and cents basis, that to-day

This is the nineteenth lesson of
The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 19

By Ara Marcus Daniels

A TYPICAL piping run for the one-pipe low-pressure gravity circuit system of steam heating with wet return is shown in Fig. S-4-1. This is probably the most common system of one-pipe steam heating. The steam main rises just above the boiler to a point close to the basement ceiling as at M and then grades down uniformly from this high point with a fall or pitch of about 1 in. (or slightly more if height is available) in 10 ft. of run. After serving the last radiator, the main drops as at N and O and runs back to the boiler. It may be carried higher than the water line in the boiler (as shown by a light dotted line) as a dry return, or after supplying the last radiator, it may drop to a lower point as at P (such that the proper pitch can be maintained to the boiler entrance) and run back lower than the water line in the boiler as a wet return (see heavy dotted line). As a wet return it carries only condensation.

Return piping should be graded about 1 in. in 20 to 30 ft. in gravity work. An automatic air valve should be installed on the end of the main where it drops, as shown at N.

The distance or height (represented by Q) of the end of the main as at N above the boiler water line must be carefully determined in order that water may not back up from the boiler through the return main and flood the steam main or part of it, air valves and branches.

The determination of this height Q will be fully

*Copyright, 1926, *Ara Marcus Daniels.*

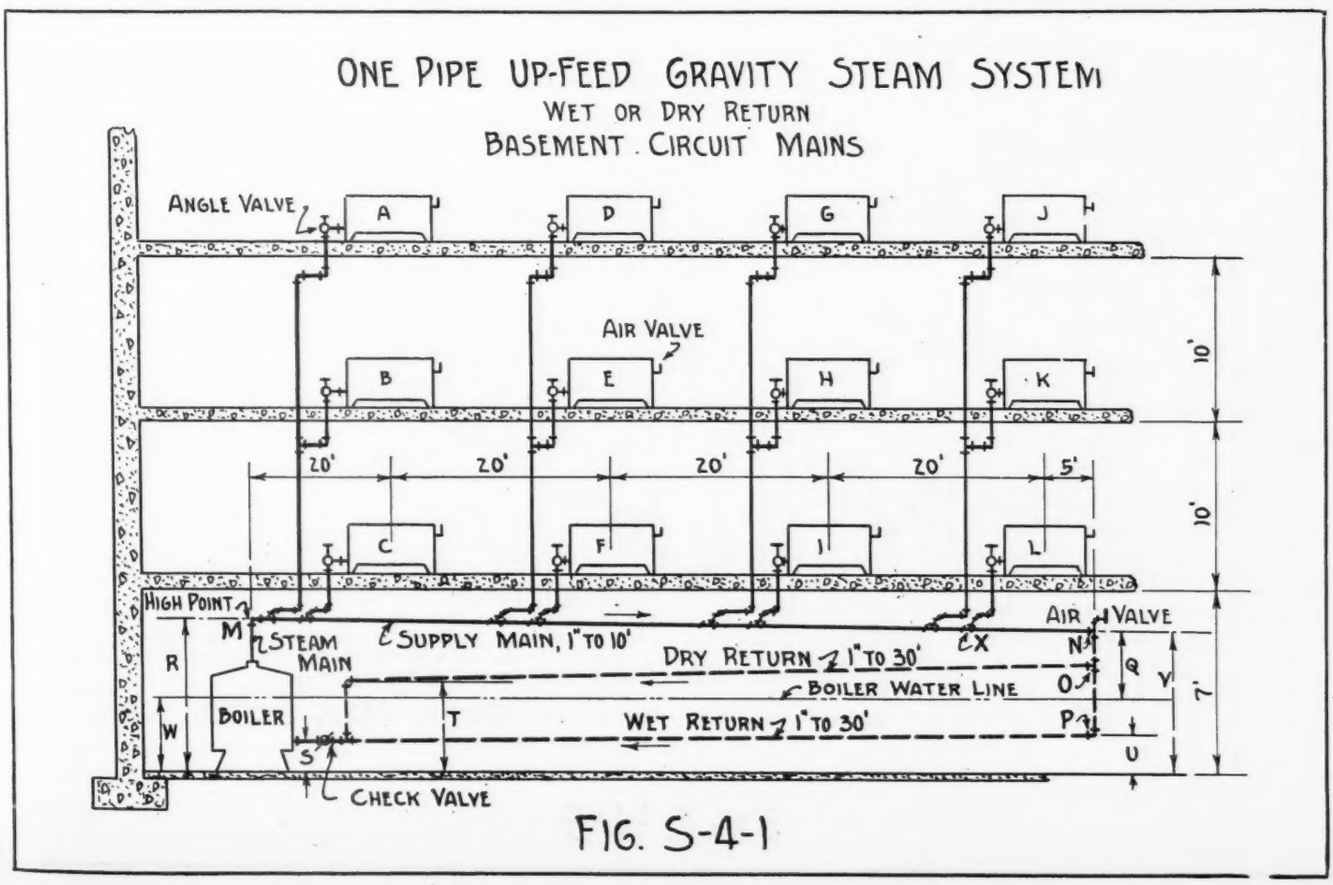


FIG. S-4-1

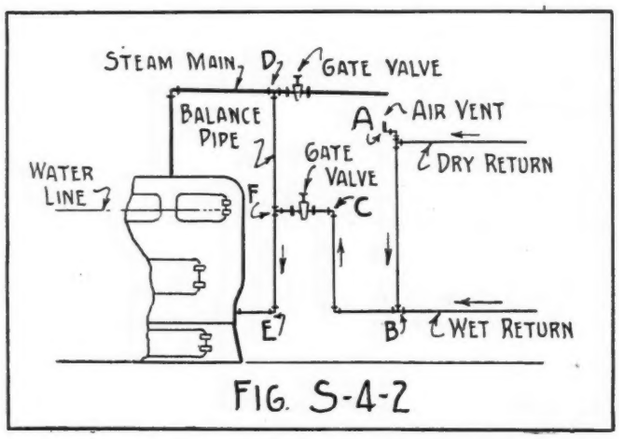


Fig. S-4-2. Piping at Boiler for Equalizing Pressure in Supply and Return Main

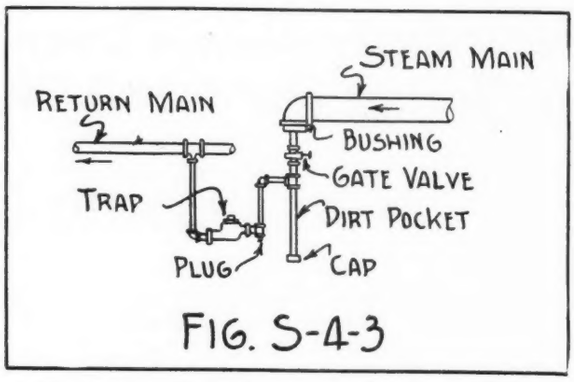


Fig. S-4-3. Drip Piping at End of Steam Main Preferred to that of Fig. S-4-4

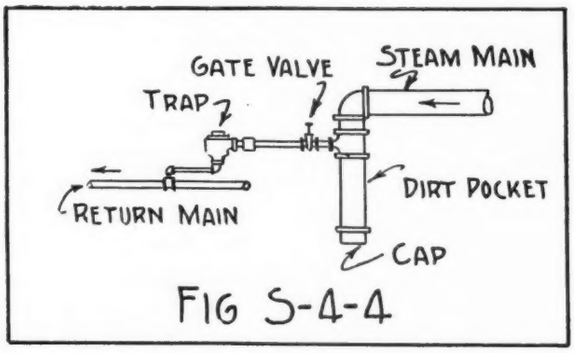
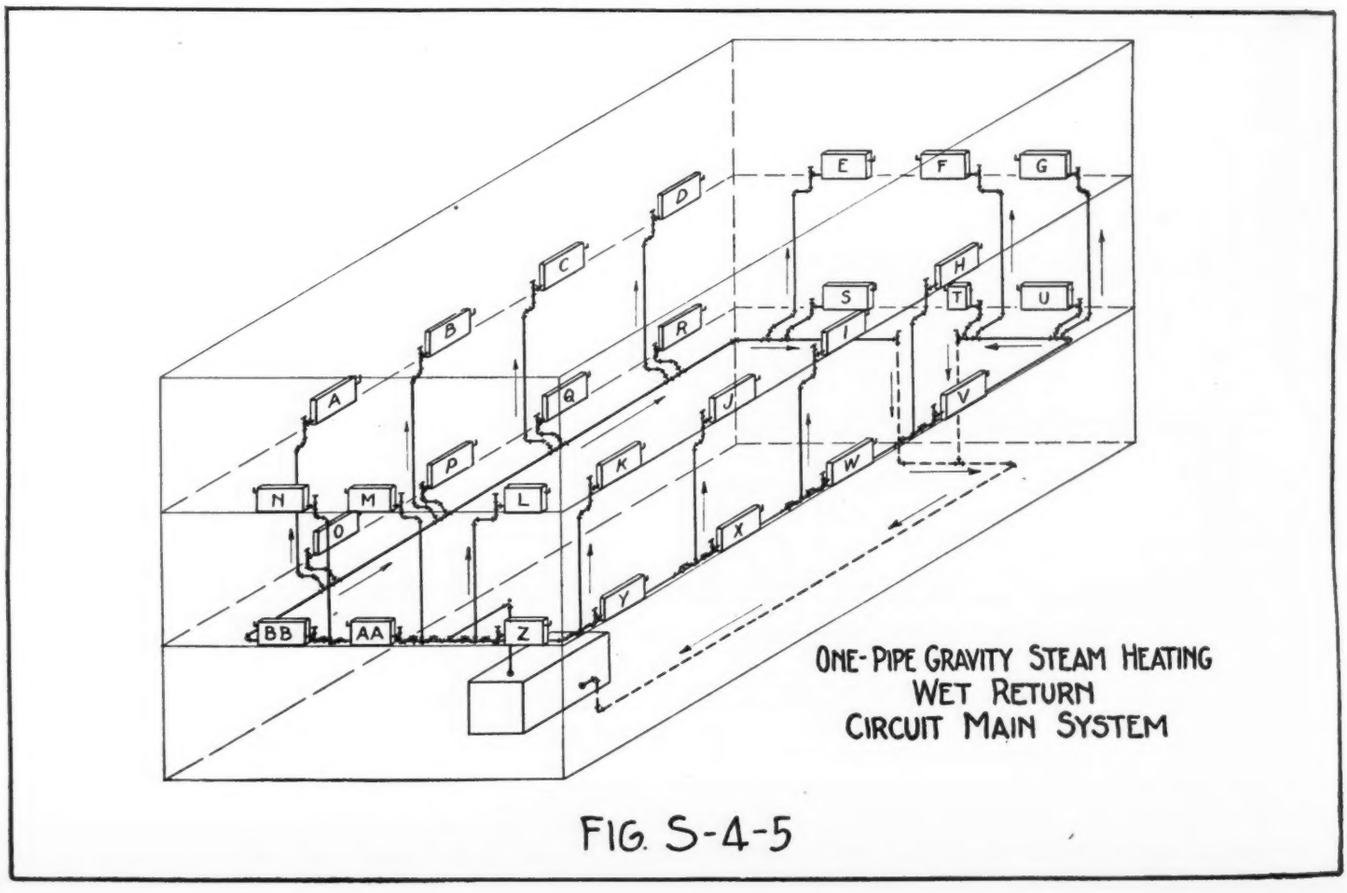


Fig. S-4-4. Alternate Method of Dripping Steam Main at End

covered in a succeeding lesson. At this time it should be remembered that the height at this point of the system has much to do with success or failure of the installation.

It is customary to maintain at least 12 in. and, preferably, 18 in. between the under side of the main at the drop point and the normal water line of the boiler. Provision should be made to guard against the possibility of water leaving the boiler when first starting up. The check valve installed in the return is the more common method of preventing water from leaving the boiler when the pressure is raised suddenly. This is liable to happen when first starting up the system. At such time, the pressure drop is greatly increased, due to the rapid passage of steam through the piping and the large amount of condensation resulting from the low temperatures of the radiators.

As the steam condenses in the system, a partial vacuum tends to form in parts of the system far



from the boiler, and as pressure within the boiler is exerted in all directions, downwards with as much force as upwards, the water, unless checked, will be forced downward and out through the returns. The purpose of the check valve is to prevent water being forced out of the boiler, pending the restoration of a normal pressure difference between the boiler and end of the system—and the check valve performs this function fairly well, providing the condition is not of too long duration.

If the radiators are exceptionally cold and the abnormal pressure difference persists, the water will accumulate in the returns, back of the check valve, until a height sufficient to overcome the pressure difference occurs in the returns. This may actually mean a considerable quantity of water, depending upon the length of the piping runs. It may amount to enough to lower the water line in the boiler so much as to cause damage to the boiler.

Fig. S-4-2 shows a much better method for making the connections at the boiler. It may be applied to either one- or two-pipe jobs having either wet or dry returns. The steam mains and returns are run as explained in this and succeeding lessons. The arrangement of the piping to accomplish the desired result is made at the boiler. The return is vented as shown at A and dropped to a point B on a line with the return opening into the boiler. It is then brought upwards to C to form a water seal. This point C is located at a height corresponding to the height of the water line of the boiler. A line is run (from D to E) connecting into the steam main at D and extending vertically downwards to the level of the return on boiler at E. In this line a tee, F, is located as shown and into its side opening, the return from C is connected. From Point F, this pipe carries all the condensation in the system.

Thus the escape of water through the return is prevented should a sudden increase of pressure in the boiler or decrease of pressure in the returns occur, or in case both conditions should happen at the same time. The boiler pressure is exerted both at the bottom and top of the column DE and thus effectively prevents the backward movement of the water. In case the pressure difference is great enough, the water will be forced downward in the central column from C and steam will move over into the dry return sufficiently to restore the pressure, less the difference in height pressure as represented by the distance from the water line to the dry return.

Work Problem S-4-1

Low-pressure heating jobs are sometimes fitted with a pressure-reducing valve at the boiler. If this is not done and the only means of producing a pressure drop in the system is by condensation and friction, it is good practice to drip the end of the return at the boiler, providing the last connection taken off is not too far away. When the distance is so great as to cause the cost of pipe and pipe covering to be a considerable item of expense, it is well to end the steam main at the last connection and continue full size to a full-size ell and drip it as shown in Fig. S-4-3. Another form of drip connection that is much used is shown in Fig. S-4-4. Since this arrangement leaves the diaphragm of the trap in almost constant contact with steam, the result is likely to be chattering or other objectionable noise. The arrangement of Fig. S-4-3 is believed better since the trap is submerged most of the time. The gate valve for gaining access to the trap for cleaning may be placed in the reduced size dirt pocket, and thus permit cleaning without lowering the pressure in the system.

Work Problem S-4-2

Since in the system shown in Fig. S-4-1, the steam main carries steam and water, for small installations the pipe should be run full size from boiler to the end of the main, using tables given in the preceding lesson for determining sizes.

Work Problems S-4-3, S-4-4, S-4-5

Fig. S-4-5 shows a one-pipe low-pressure gravity circuit main system installed in a two-story building. The main branches above the boiler and runs around the two sides of the building with each end dripped into a wet return. Radiation values are assigned in the following problem and the student is to submit a complete piping design for this system, noting all necessary valves and other equipment. In determining the size of the mains, lengths, as given in the problem, and the effect of all fittings are to be considered.

Work Problem S-4-6

ONE-PIPE GRAVITY RELIEF SYSTEM

A typical elevation layout of this system of piping is shown as Fig. S-4-6, while the application is illustrated in Fig. S-4-7.

This system is very similar to the one-pipe circuit system, except that the risers are dripped individually into the return from riser to return, (note the narrow broken lines), the steam main carries no condensation from radiators. It is itself dripped. This permits reducing the size of the main where a branch is taken off and the main is relieved from carrying condensation at each point where there is a take-off for a riser. If the risers are far apart, separate drips are sometimes installed to relieve the main of condensation. The return may be run either wet or dry.

Fig. S-4-8 shows the preferable manner of making connections from the main to riser and connecting the drip line into the wet-return main.

The return mains for the one-pipe relief system are usually run along the walls near the floor or as nearly under the risers as practical. A wet return is preferable, but if a dry return is absolutely necessary, the drips should all be water-sealed, as explained later in connection with a two-pipe dry return gravity system.

Work Problem S-4-7

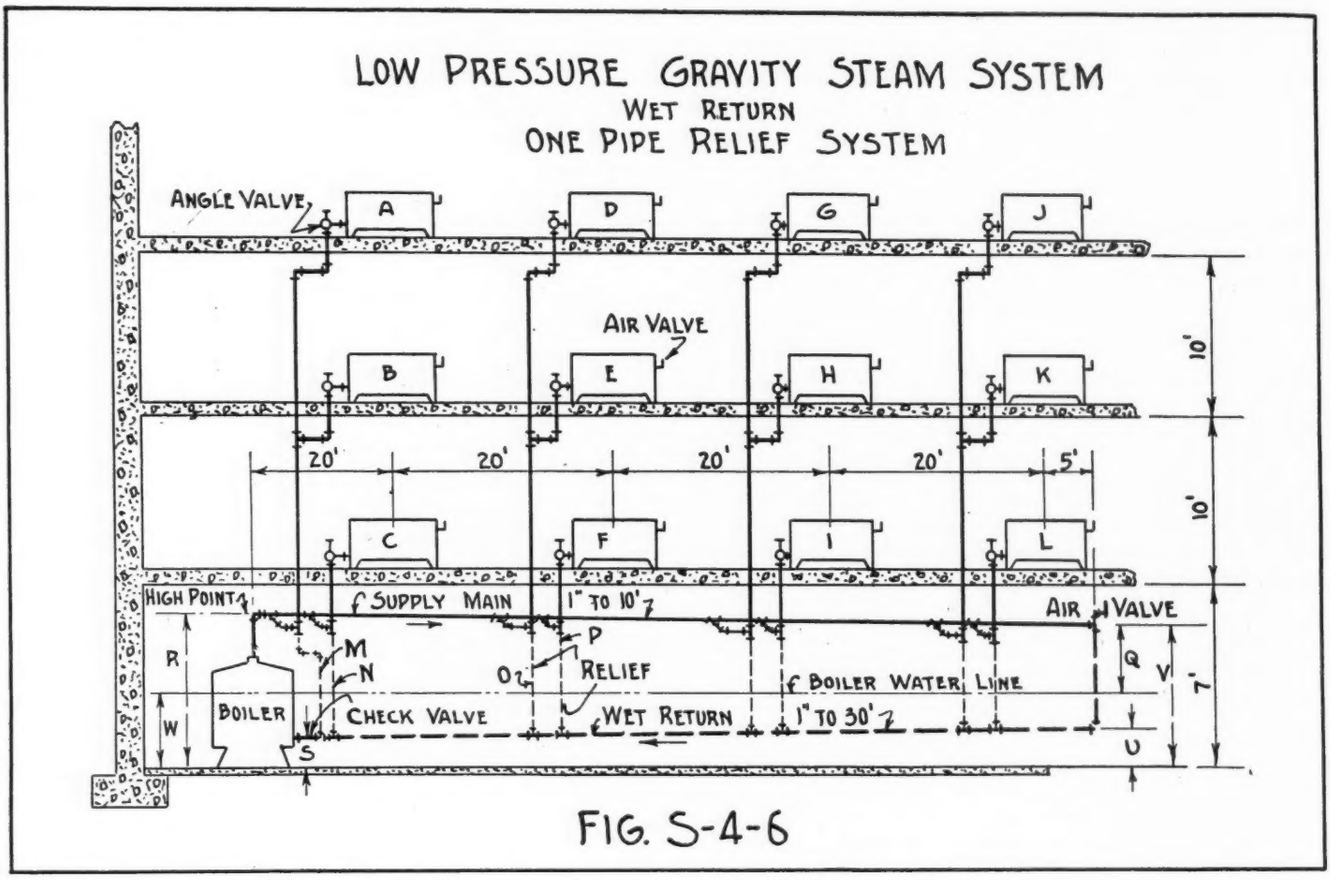


FIG. S-4-6

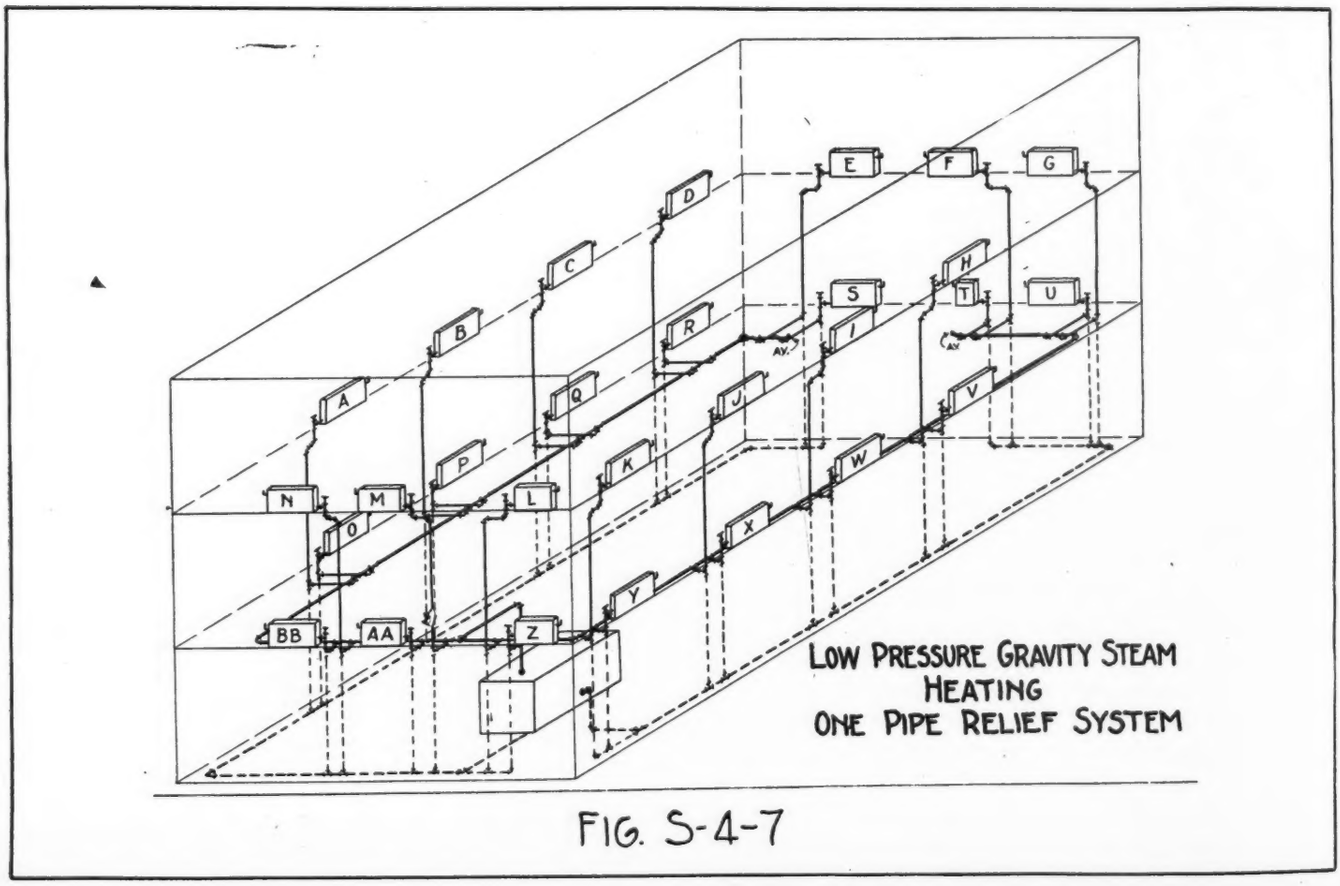


FIG. S-4-7

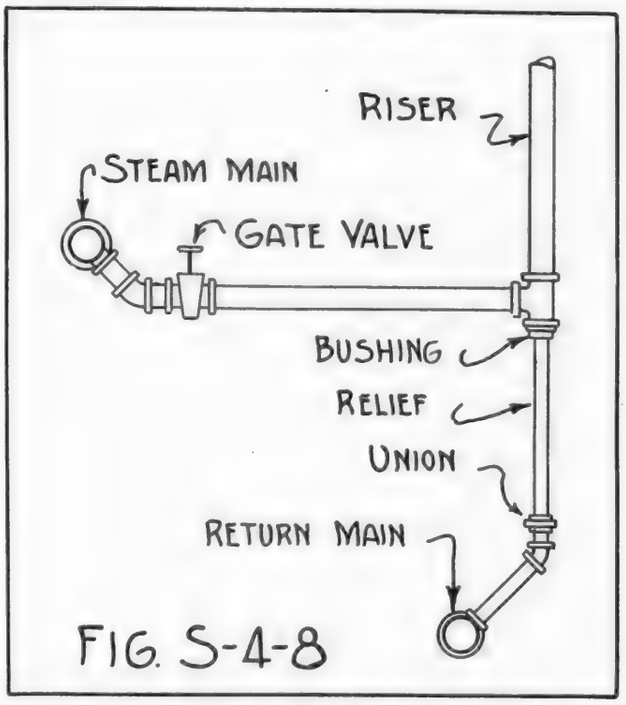


Fig. S-4-8. Piping Connections for Steam Main, Riser and Relief Drip

The sizes of mains, branches, risers and radiator valves may be determined by the proper table given in the preceding lesson. Sizes for the relief pipes should be taken from Table S-4-1. No drips for the main are shown in Figs. S-4-6 or S-4-7 because the radiator branches are far apart. Table S-4-2 may be used for other piping systems when such drips are required.

TABLE S-4-1
RELIEF SIZES

RISER	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	4½"	5"
RELIEF	¾"	1"	1"	1¼"	1½"	2"	2"	2½"	3"	3"

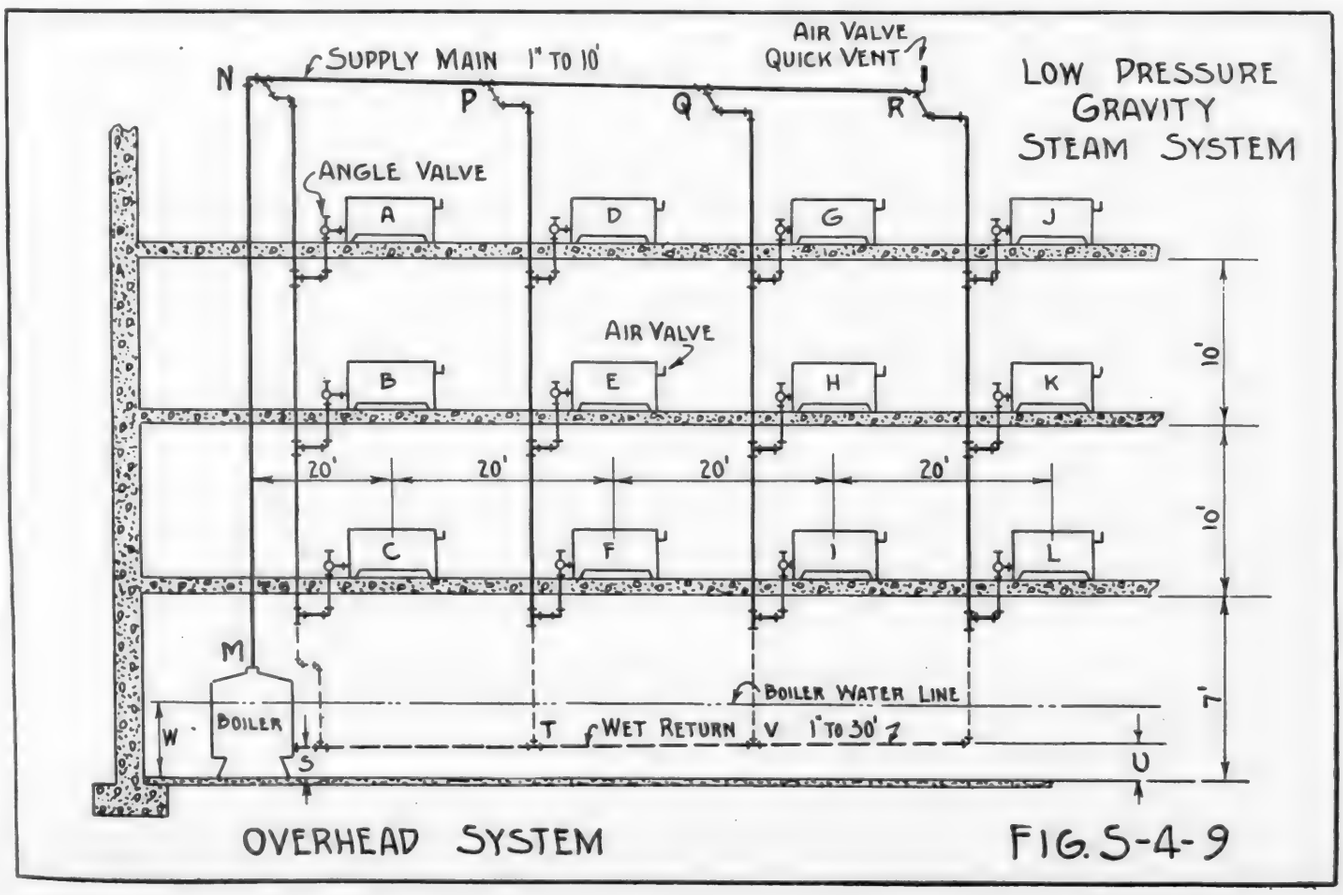
TABLE S-4-2
DRIP PIPE SIZES

DIAMETER STEAM MAIN INCHES	LENGTH STEAM MAIN - FEET			
	0 - 100	100 - 200	200 - 400	400 - 600
	DIAMETER DRIP PIPE - INCHES			
0 - 2	½	½	½	¾
3	½	¾	¾	1
4	¾	¾	1	1¼
5	¾	1	1¼	1½
6	1	1¼	1½	1½

Work Problems S-4-8, S-4-9

ONE-PIPE OVERHEAD SYSTEM, WET RETURN

A typical elevation layout of this system of piping is shown as Fig. S-4-9. It is applied to a three-story building in Fig. S-4-10. This system as a one-pipe job is to be preferred to an up-feed single-pipe system where the square feet of radiation



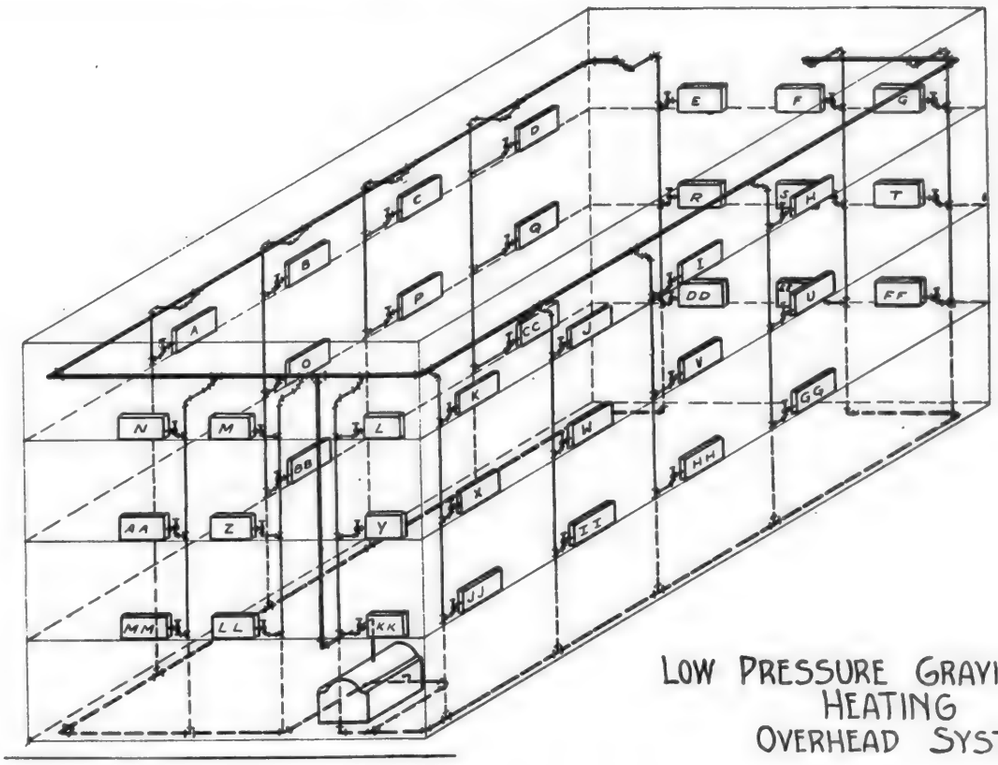


FIG. S-4-10

supplied by a riser is as much as 600 sq. ft. The condensation from this amount of surface, when flowing in a direction opposite to that of the steam, is most likely to result in unsatisfactory service.

This system and the one-pipe relief approach a two-pipe job since each has a steam main and a return main but use only one radiator connection. Referring to Fig. S-4-9, the steam main rises from the boiler at M to a point N, from where an overhead main is run around the ceiling of the top floor or in an attic above. The main pitches down in the direction of the flow. Drop risers are supplied from tees as at P, Q, R, etc., with outlet turned downward 45°. The drop risers supply the radiators and the condensation from them flows back through the radiator connection to the riser, from where it is finally drained through drips into the return main as at T, V, etc.

Work Problems S-4-10, S-4-11

ONE-PIPE OVERHEAD SYSTEM, DRY RETURN

While Figs. S-4-9 and S-4-10 show the overhead system, with a wet return, it is often installed with a dry return. With such an arrangement, no connection from a radiator or a drip from the end of a main or the bottom of a drop riser should be connected into a dry return, without using a radiator trap or horizontal swing check valve for every drip. Fig. S-4-11 shows two methods of making radiator connections (a) with a check valve, (b) with a thermostatic trap. If the connections are not made in a manner similar to one of those shown, the steam will short-circuit through the

(Continued on Page 76)

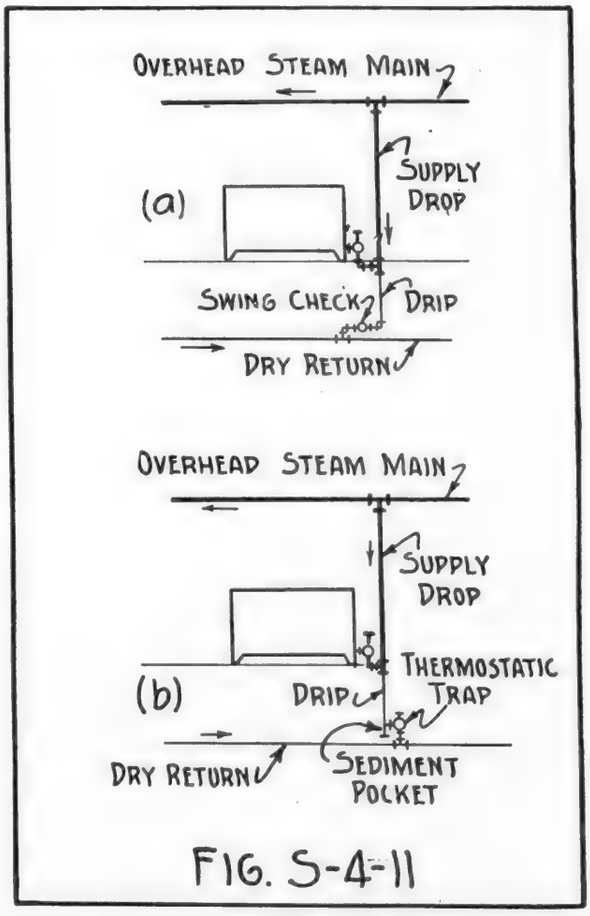


FIG. S-4-11

Fig. S-4-11. Piping Connections Between Supply Drop, Radiator and Dry Return

Fundamental Factors in District Steam Distribution

How to Predetermine Initial Pressures, Transmission Line Location and Other Elements to Secure Best Results

(From the Report of the Distribution Committee of the National District Heating Association, Presented by W. W. Stevenson, Chairman, at the Seventeenth Annual Convention, Niagara Falls, June 1-4, 1926.)

IF it is fair to assume that most of the distribution systems for supplying low-pressure steam for district heating purposes have just "growed", Topsy-like, to meet the daily or monthly or yearly increments of demand, then the report of the Distribution Committee of the National District Heating Association, presented by its chairman, W. W. Stevenson, at the association's recent annual convention, represents a distinct contribution to the art.

It is one thing to put in a pipe here and a pipe there to take care of the new customer, but an entirely different matter to sit down in cold blood and lay out a distribution system for a community, in full knowledge, based on the present state of the art, that it represents the most economical method of supplying the territory in question when a reasonable proportion of the ultimate business has been acquired, and that, in the development of the load, only additions to the system will be necessary.

Ripping out existing lines because they have become too small is an expensive pastime, yet this is being done every day, frequently because the mains were not first laid down in accordance with a definite plan taking cognizance of ultimate possibilities of demand. Naturally, every problem is specific and must be evolved from the local data. Mr. Stevenson has but worked out a logical analysis of the problem, developed basic data that may be applied to any particular case, indicated clearly the variable factors that may affect these data, and the limits of their variation. It would seem that this analysis supplies a very tangible skeleton upon which an engineer of average technical ability and clearness of vision can determine the best distribution system to suit his local conditions, with the knowledge that none of it will have to be removed for reasons of inadequacy, but that predetermined additions, as the load develops, will finally bring the physical system to meet the ultimate load of the community.

STEAM, GAS AND ELECTRIC DISTRIBUTION PROBLEMS SIMILAR

When we stop and consider that steam, gas and electricity are, essentially, fluids, it becomes evident that the problems and the laws by which the problems are solved must follow the same inexorable fundamental truths. We find, in each case, the development of transmission by high pressure, or potential, where long distances are to be covered; the reduction or transformation from these transmission pressures to lower or service pressures; the interconnection of lines to better equalize pressures and to mitigate against interruption of service. In many ways the solutions of problems in these media are parallel, differing mainly in the terms and units used, and in the physical considerations attending the actual installations.

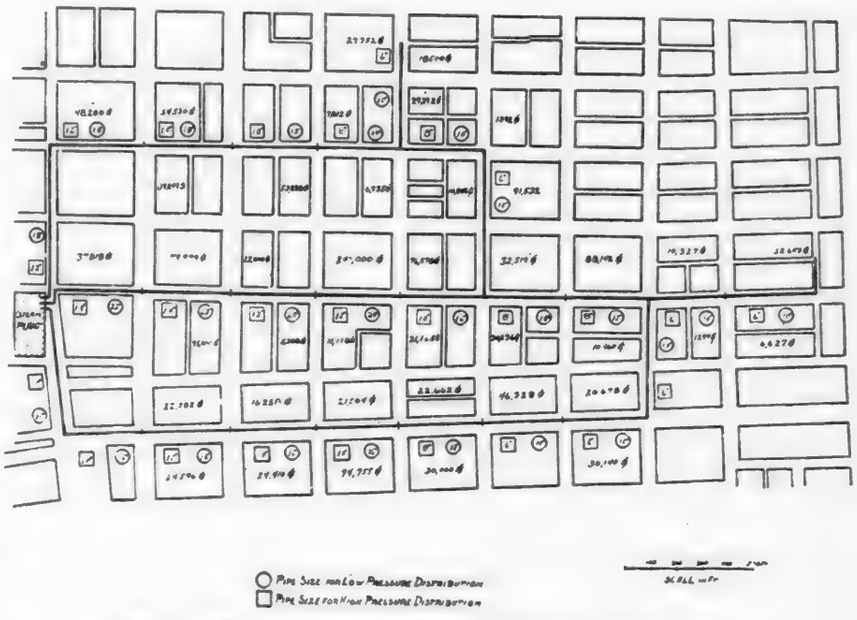


Fig. 1. Typical Layout of District Heating System for 1,615,000 Sq. Ft. of Radiation

With this prelude, the fundamental points to be considered in the design of a steam distribution system, as discussed by Mr. Stevenson, may be enumerated. These are:

(a) General plan and survey.
(b) Transmission-line pressure and load factor.
(c) High-pressure feeders.
(d) Initial-pressure variations.
(e) Types of underground construction.

(a) General Plan and Survey

The first and most important point to be considered in the design of a central heating distribution system is a careful and proper survey of the district and business to be served. A number of central heating companies have gotten into serious and expensive difficulties because their system was designed without proper provision for future expansion, and in order to serve new business it has become necessary to replace existing mains with larger ones or to install additional mains, which necessity has greatly increased their capital investment. Therefore, a careful survey should be made, showing the requirements of the system for the first year of its operation and for various succeeding years, as nearly as they can be determined, up to twenty-five or thirty years from its beginning. This period of time is considered because it is reasonable to expect that underground mains should last at least this long.

From weather statistics for the district to be served, and by comparison with known conditions in other districts, the peak demand and seasonal consumption of steam may be estimated. From these data and the estimates of business to be served, proper main sizes may be determined and noted on a map of the district.

It is good practice to begin with the extreme or final condition and design the system for this condition, then to work back year by year, assuming only those mains installed which will be necessary for the business estimated up to that particular time, and determining whether or not the distribution is going to be proper under those conditions. In short, the idea is to design the system for ultimate conditions in such a manner that it may be installed piecemeal and give satisfactory service in the various stages of its development.

In determining main sizes an error resulting in a main size too large is much less serious than an error resulting in a size too small, as the difference in investment necessary for the various pipe sizes is nowhere near in proportion to the difference in capacity of the mains, and with present-day construction the life of steam mains underground will undoubtedly exceed the twenty-five or thirty-year period for which their size is selected.

Determination of main sizes is based on Unwin's formula for pressure drop in steam mains. This formula is used for all steam-line calculations in this report.

In laying out a steam-distribution system, it is good practice, in so far as possible to have the mains so interconnected as to provide duplicate methods of supply to at least the major sections of the system, so that the amount of main to be shut off for a maintenance job of any sort will be a minimum.

In the larger cities, at least, it is proving advantageous to lay mains in the streets rather than in the alleys. It is true that because of the lesser width of the alleys, investment in services may be reduced, but, on the other hand, the subsurface

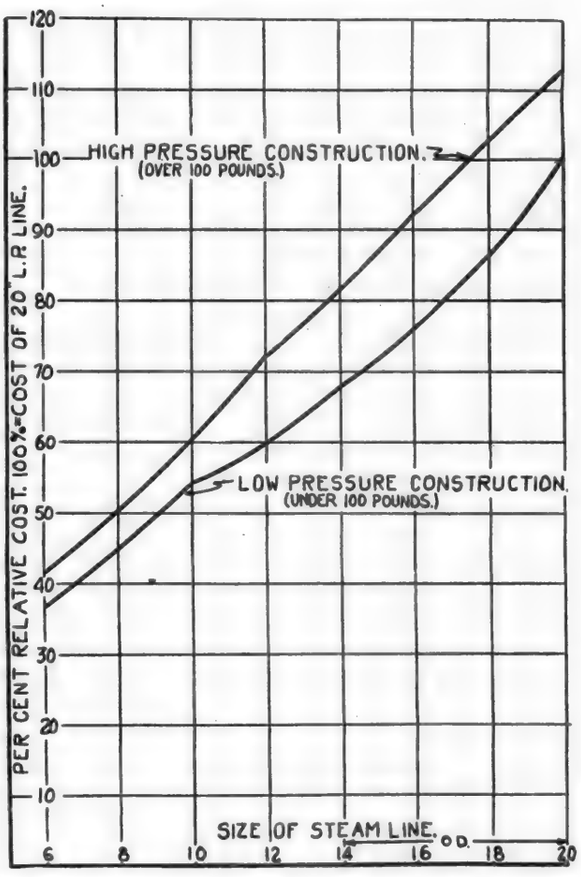


Fig. 2. Relative Cost of Underground Steam Lines

congestion in the alleys greatly increases maintenance costs.

The designer of any underground distribution system should always aim to arrange his piping routes and sizes so as to avail himself of the capacity of each individual line to the greatest extent, thereby gaining ease of operation and maximum results from minimum investment.

In deciding upon the location of steam mains in the streets the following procedure may be used to advantage:

First: Obtain all possible information from other utilities and city engineers as to the location of other lines in the streets.

Second: Make a field check of the location and depth.

Third: Make a drawing indicating by code these lines in their respective locations.

Fourth: Determine the best location remaining for the steam line and in case fittings are installed, plot the location of all buildings, anchors, etc., making allowance for maximum setting of traverse of all slip-joints.

(b) Effect of Initial Pressure and Load Factor on Transmission Line Costs

Recent tendencies in the distribution of steam have been along the lines of higher initial pressure and the necessarily heavier construction thereby required. However, the result has been an overall

saving in transmission costs, even with the low load-factors encountered in the heating industry.

In order to bring out this point more clearly, a study has been made of the relative costs of transmitting a maximum of 100,000 lbs. of steam per hour for a distance of 1,000 ft. from a boiler plant to a heating system, it being assumed that a pressure of 5 lbs. is needed at the heating system.

As the average heating system operates with a load factor between 20% and 30%, the final results have been plotted, assuming an average hourly steam delivery for the year of 20% and 30% of the maximum hourly load.

The most important parts of the cost of transmission are the fixed charges. These were arrived at by estimating the cost of building a steam line 1,000 ft. long of various sizes. These costs assume that the line averages 8 ft. deep and that an asphalt pavement with a 6 in. concrete base had to be dug up and replaced. Standard weight pipe, cast-iron fittings, and a 2 in. thick covering were assumed for all steam lines requiring an initial pressure of 100 lbs. or less. For all lines requiring over 100 lbs. initial pressure, heavy pipe, extra heavy cast-steel fittings, and a 2½ in. covering were assumed.

Fig. 2 shows the relative cost of the various-sized lines, 100% being taken as the cost of a 20 in. low-pressure line.

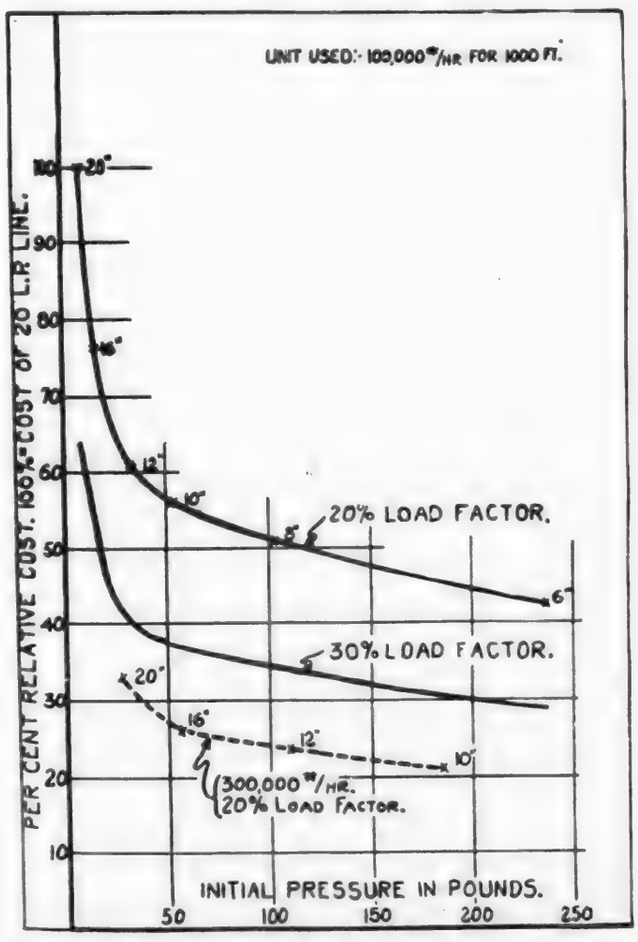


Fig. 3. Relative Cost of Transmitting Steam at Various Initial Pressures.

Thus it will be seen that a 6 in. low-pressure line costs but 37% of a 20 in. low-pressure line, and in general, high-pressure construction averages from 12% to 20% more than low-pressure construction for the same sized line.

Fixed charges were considered in each case as made up of the following:

Interest	8%
Depreciation	3%
Taxes	2%
Maintenance	2%
Total	15%

The depreciation of 3% of the cost, if invested at 5%, will retire the entire cost in twenty years.

While maintenance is not, strictly speaking, a fixed charge, it varies in general with the size and cost of the installation, and in order to simplify the figures it has been included with these items.

The other item entering into the cost of transmission of steam is the value of the heat loss. This has been figured on the following assumptions:

Coal per ton	$4.00
B.T.U. per lb. of coal	12,500
Boiler efficiency, per cent	70
Hours use per year	5,808
B.T.U. loss per hour, per sq. ft. of pipe surface, per degree difference in temperature	.224
Outside temperature of covering, deg. F.	125

This again is an assumption and is only approximately correct but has been used for the sake of simplicity.

The initial pressure required to deliver the maximum amount of steam, namely, 100,000 lbs. per hour, at 5 lbs. terminal pressure, was calculated for each size of steam line, the losses figured from the steam temperatures and the fixed charges from the cost of the proper sized line.

The relative cost of transmission per 1,000 lbs. of steam were then plotted against the initial pressures, using a 20 in. low-pressure line with a 20% load factor as 100%. (See Fig. 3.) To show the effect of increased load factor, the relative costs at 30% load factor were calculated and are also shown.

A study of Fig. 3 will show that a high-pressure feeder will save from 50% to 60% of the cost of transmitting steam over the installation of a low-pressure line. It should be noted, however, that these costs do not include any figures bearing on the relative cost of generating steam at different pressures.

As further evidence supporting the statement that higher pressures materially-reduced the transmission costs, Fig. 4 and the following deductions are presented. These figures represent a typical district of a city containing 1,615,000 sq. ft. of radiation where heat from the Central Station is to be furnished. Two systems are possible: (a) low-pressure construction, delivering steam from the plant at a maximum pressure of 20 lbs., allowing a drop of one pound per 100 ft. and maintaining five pounds' pressure at the end of the system.

Standard weight fittings, welded joints, and 2 in. thick covering are assumed.

(b) High-pressure construction delivering steam from the plant at a maximum pressure of 150 lbs., allowing a drop of 2 lbs. per 100 ft. and maintaining 100 lbs. pressure at the end of the system. Extra heavy steel fittings and pipe, welded joints, and a 3 in. thick asbestos covering are assumed.

Using the same basic data as was used in the first part of the discussion, it is found that, first, the fixed charges for the high-pressure construction will be 78% of the fixed charges for the low-pressure construction. Second, that the heat losses from the high-pressure construction will be approximately 30% greater than for the low-pressure construction. Third, that the total transmission costs for the high-pressure system will be in the neighborhood of 4.7c per 1,000 lbs., or 80% of the transmission cost for a low-pressure system, allowing a 26% load factor.

In addition to the above savings there is a further advantage in the high-pressure system, in that it will be possible to furnish high-pressure steam for certain industrial purposes, cooking, etc., which uses could not be taken care of with the low-pressure system.

(*The conclusion of this report will discuss the problems of high-pressure feeders, variation in initial pressures and types of underground construction*).

New Home-Study Course in Steam and Gravity Water Heating
Lesson No. 19
(Continued from Page 72)

drip connections and hold back the water of condensation with the result that the pressure on the return will force the water upwards in the drips and risers connected further along the line. A special check valve should be used for this work. The proper valve has a very light weight clapper that hangs in an almost vertical position so that the weight of only a little water is required to open it.

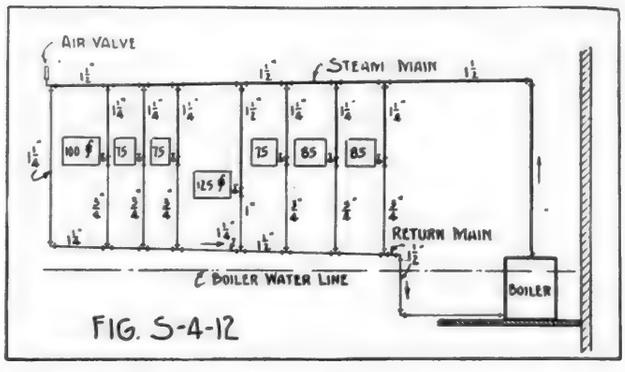


Fig. S-4-12. An Overhead Steam System that Functions Poorly

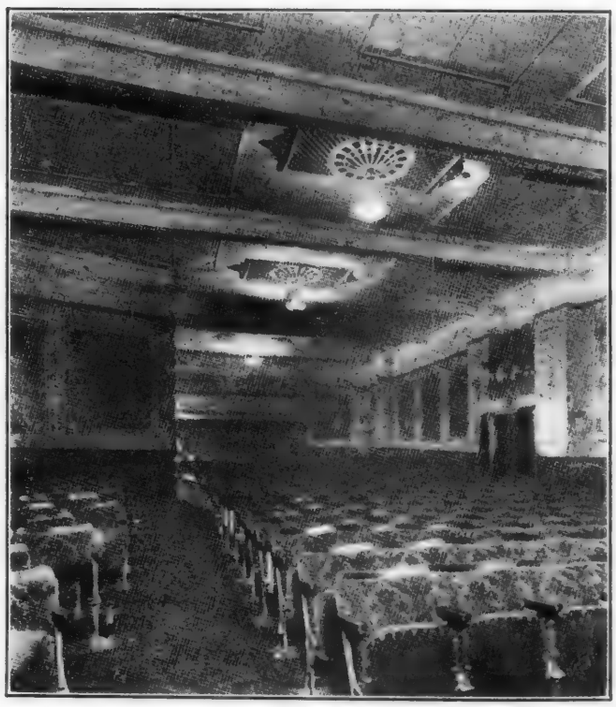
Fig. S-4-12 shows diagrammatically the run of piping for a one-pipe down-feed system that, as laid out, does not function properly. The student will submit a new piping arrangement, properly connected and sized as required in the following problem.

Work Problem S-4-12

The next installment, to appear next month, will include details and designs for two-pipe steam systems with wet and dry returns.

Panel Heating With Electricity

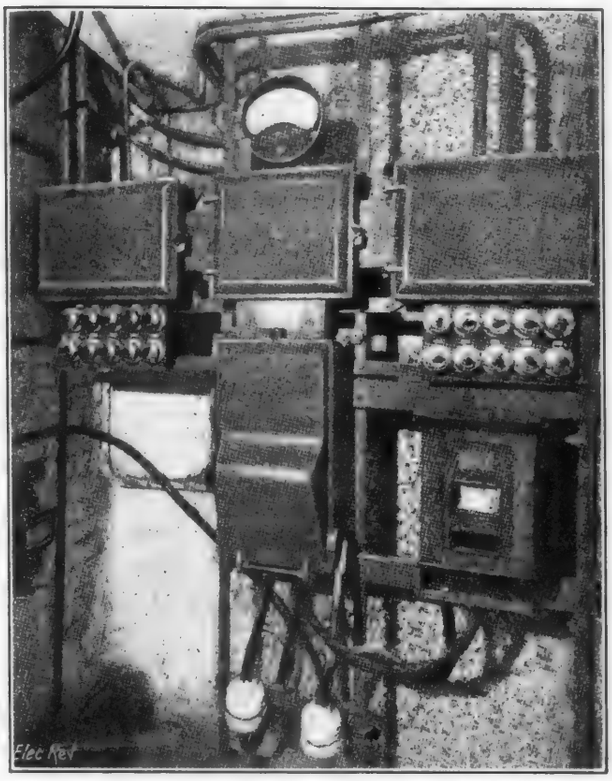
WHILE panel heating has been used with success in some hotels and office buildings in England, the first theatre to be equipped with an electric panel heating system is the Cinema de Paris in Leicester Square, London. In a description of this system by R. M. Bussy, appearing in the *Electrical Review*, of London, for January 1, 1926, it is stated that standard size or unit panels



View of Auditorium Showing Panels in Place

have been utilized throughout the theatre, being 6 ft. x 3 ft. x 1⅛ in., fixed on the surface of the ceiling and finished with a suitable moulding, so that they follow the general lines of decoration. This method of fastening to the ceiling was employed in this instance to save time in erection, but it is customary to bury or form the panels in the ceiling, thus making a smooth surface.

There are 34 standard panels in the auditorium ceiling, two in each of two entrance corridors and another in a third corridor. Each panel is fastened with 6¼ in. bolts, two passing through the roof, and four lugged into it. The conduit, of heavy gauge, is imbedded under the cornice along each



View of Switchboard Showing Ammeter, Switches and Ironclad Switch- and Fuse-Boxes

side of the auditorium. Panels are wired in pairs, each pair having a separate switch and pair of fuses.

THE SWITCHROOM AND ITS EQUIPMENT

The switchroom is situated by the side of the projection room, at the end of the theatre. Included in the switchboard equipment is a main 150-ampere ironclad switch and fuses surmounted by a connector box, on either side of which is a two-way ironclad fuse board. The central connector box provides protection for the extended bus-bars, the connections from the main switch and the connection of an ammeter. Under each fuseboard is a panel supporting ten rotary switches.

The ammeter is of the long-scale type divided in such a way as to show a definite movement as each circuit is energized. This enables the operator to see at a glance whether each circuit is in perfect order when he manipulates its switch. The whole of the switchgear is mounted on a metal frame and efficiently earthed.

SWITCHING METHOD GIVES CONTROL OF SEVENTEEN VARIATIONS

The method of switching that has been adopted gives a control of 17 variations, not only of radiant heat emitted, but also of location of the panels emitting. The heat control enables the auditorium temperature of 55° F. to be maintained constantly, while the control of the panels from the point of view of location enables variations of wall absorption, due to variations of wind, to be counteracted.

It is due to this perfect control that the consumption of electrical energy is so low. In the extreme case of a prolonged outside temperature of 30° F., only 23 K.W. are required to maintain a temperature of 55° F. in the whole of the theatre when it is empty; when the temperature outside is about 42° F., not more than 15 K.W. are required.

These figures are based on the assumption that there is no audience present and therefore, are higher than is generally found necessary in practice.

At the Cinema de Paris, it is stated that the freshness and coolness of the atmosphere is what first impresses the visitor as he enters the building. With regard to maintenance cost, it should be stated that special prices are quoted by the electrical companies for such loads as these. Moreover, the control requires no special operator.

A simple chart has been hung on the switchroom wall and on it the panels are indicated and numbered, the numbers referring to the switches by which they are operated. In this way, all one has to do is to look up the chart for the reference numbers of the panels that are to be put into use and then turn the corresponding rotary switches.

The installation was made by Messrs. Grierson, Ltd., the patentees, according to the instructions of the architect, Robert Atkinson Frida.

Saving Millions for American Business

On the premise that American Business concerns have long been contributing millions of dollars a year to a thousand and one varieties of so-called advertising mediums, the Associated Business Papers, Inc., of New York, has recently published a pamphlet entitled "Saving Millions for American Business," which presents a clear-cut analysis of the situation. The high selling cost, the secondary consideration of editorial quality, the doubtful distribution and the unwilling class of readers reached, are some of the telling points presented to show why the American business man should say "no," emphatically and finally, to the solicitations of what have come to be known as "irregular media."

September Conservation Number

AS in previous years, THE HEATING AND VENTILATING MAGAZINE for September will be featured as a Conservation Number. Designated originally as a Smokeless Boiler Number, later issues were broadened to embrace the field of Fuel Conservation. Even that term has become outgrown, and this year the designation has been enlarged to Conservation Number. The forthcoming issue will be devoted not only to fuel saving, but to conservation on a broad scale, including conservation of time and energy. Methods and practices will be portrayed showing the trend of the times in the whole field of coal, gas, and oil burning, particularly in the way comfort and convenience have taken their places in the conservation program.

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IF we were to name the three most important developments in heating and ventilating practice during the past few years our choice would fall on the copper radiator, the portable unit heater and the "dry" air filter. And yet, paradoxical as it may seem, none of these devices, strictly speaking, is new. Copper radiators were commonly used in Europe long before the World War and portable unit heaters were manufactured in America as early as 1870. As for "dry" air filters, their novelty lies in the filtering surface and fluids used, rather than in the idea itself. This, however, in no way detracts from the fact that, to all intents and purposes, the introduction of all three classes of apparatus, in their present forms, marked an epoch all the more remarkable because its full significance was not generally realized at the time. In the case of the unit heater, this is stating the case mildly. Outside of the columns of THE HEATING AND VENTILATING MAGAZINE one will look in vain for the recognition of unit heater practice in general engineering literature until quite recently.

But now the logic of events has proved irresistible and we find the unit heater sitting "on top of the world" as one of the most important factors in the industry to-day. So much so that the best engineering minds are applying themselves, none too soon, to the guidance of unit heater design along the best lines. Just now the question at issue revolves around the relative advantages of floor-mounted and ceiling-mounted units. The argument for the floor-mounted type has already been made and it now remains for the advocates of the ceiling-mounted types to present their case.

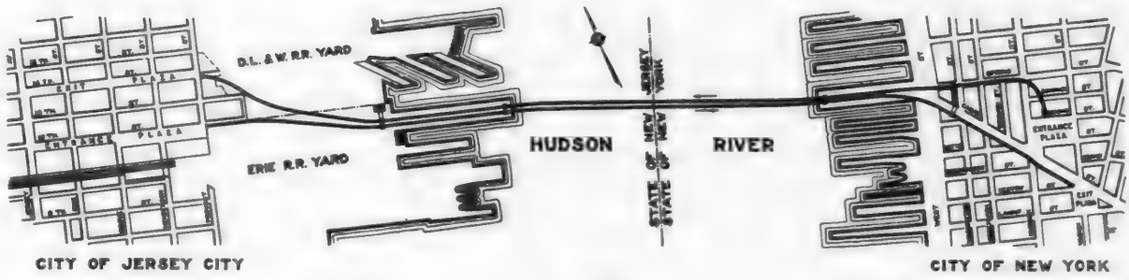
SINCE the introduction of copper heating surface for indirect work, the adoption of copper radiation has been little short of phenomenal. Beginning with its use in connection with fan-blast systems, we have seen it become practically standard practice throughout the unit ventilator field and, within recent months, its use has been still further extended to "invisible" radiator and heating cabinet design. Surely "the world do move."

WHEN the so-called "dry" air filter was first announced, it is worthy of note that it was backed by interests which, at that time, were new to the heating industry. No finer tribute could be paid to the intrinsic merits of the dry filter idea than to say that within the short space of three years since their introduction, dry air filters have made their way to a point which places them among the most approved appliances for cleaning air. How rapidly the art is developing is indicated in the application, on a wide scale, of the dry filter principle to "continuous" units in which the removal of the sludge and the renewal of the cleaning fluid are made automatic.

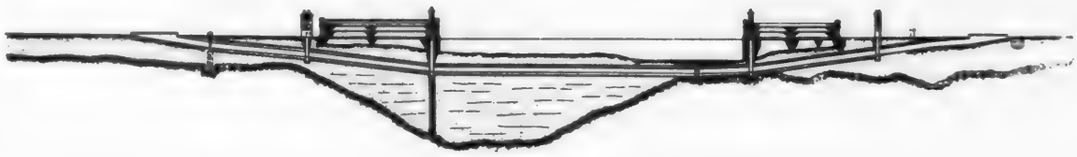
Other outstanding developments in the heating and ventilating field might be mentioned, such as the evolution of the domestic oil burner and gas boiler, but here we have three achievements bearing directly on the design of the heating system itself, which are leaving their mark on the industry very much as the globe valve, the cast-iron radiator, the multiblade fan and the air washer characterized the periods in which they first appeared.

ON another page we present some of the typical designs submitted in a competition conducted by the American Radiator Company in *Architectural Forum* to show how the basement can be utilized for living purposes. This, of course, involves the development of domestic heating plants with an eye toward cleanliness of operation. A study of the plans, we are sure, will convince the most skeptical that the American people "have been missing something" in their neglect of the basement. We have become so accustomed to treating this part of the house as a depositary for the endless variety of household impedimenta which most families accumulate that it has taken on very much the character of that deep, bottom drawer which every desk executive knows so well. We feel that a distinct service has been rendered the public in pointing the way to the resurrection of the basement to one of the most attractive and pleasant parts of the house.

Ventilating the Holland Vehicular Tunnel



PLAN

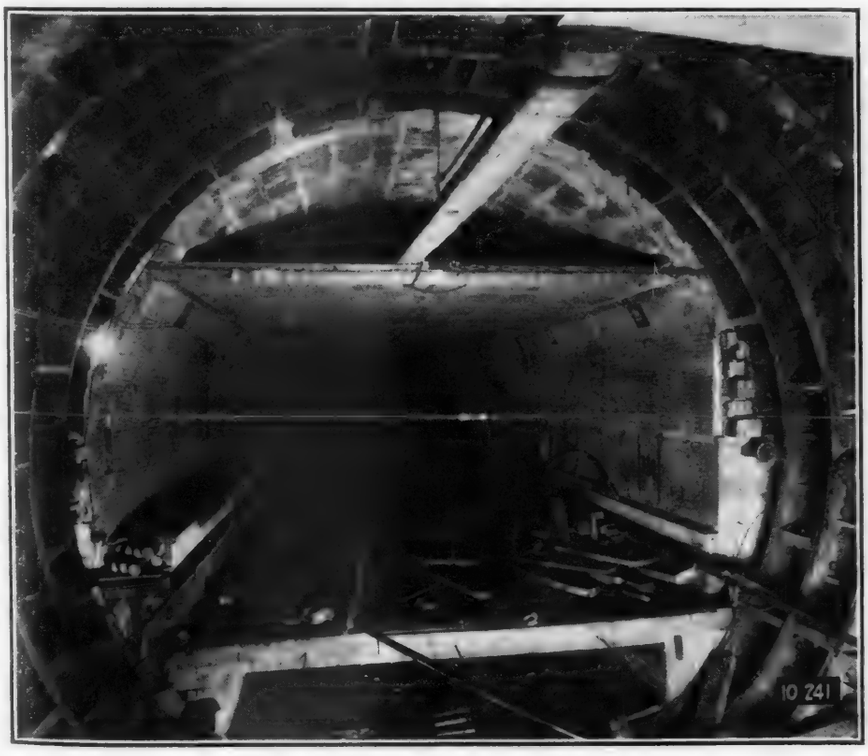


PROFILE

TUNNEL LENGTHS		CAPACITY		CONSTRUCTION DATA	
Total length of Tunnel	9,250 ft.	Number of Roadways	2	Maximum depth to top of tunnel below M.H.W.	72 ft.
Distance between Portals	8,463 ft.	Roadway widths	20 ft.	Maximum depth of roadway below M.H.W.	93 ft.
Distance between River Shafts	3,374 ft.	Headroom	13 ft. 6 in.	Quantities:—	
Length of Under-River Portion	5,480 ft.	Estimated hourly capacity (in both directions)	3,800 vehicles	Excavation	500,000 cu. yd.
		Estimated maximum daily cap.	46,000 vehicles	Cast-iron Tunnel Lining	115,000 tons
		Estimated yearly capacity	15,000,000 vehicles	Concrete	130,000 cu. yd.

The Holland Vehicular Tunnel

PRACTICAL completion of the Holland vehicular tunnel and the promise of its early opening lends renewed interest to its ventilating equipment. As has been brought out in previous articles published in these columns, on various features of the tunnel, the ventilating problem involved in this project is unprecedented. It involves a supply of air entirely by artificial means in tubes nearly two miles in length. Obviously, it would be impossible to force air into the middle of the tubes, as is done in the Liberty tunnel at Pittsburgh, because an air-shaft in the channel of the river would be a menace to navigation.



Typical Cross-Section, Showing Concrete Lining

The solution was to construct two main ventilating plants on either side of the river at a point on a line with the ends of the adjacent piers. Each station is to supply air to both tubes between the piers and to a part of the tubes on their respective land sides. Both are supplemented by stations on land which are to supply the remaining parts of the tubes.

FOUR VENTILATING STATIONS, WITH SEVEN SOURCES OF AIR SUPPLY

There are four ventilating stations in all, known as the New York land, the New York river, the New Jersey land and the New Jersey river ventilating buildings. The tunnels are divided into eight sections, the land stations supplying three of the six land sections on either side; but, in both the north and south tunnels, two of the sections on the land side of the piers are connected in series and supplied by one group of ventilating units located in the river buildings. There are, therefore, seven sources of supply, constituting seven groups of supply units of three fans each; making a total of 42 supply fans in all. The fans are down-discharge,

View of Completed Section of Tunnel. Supply and Exhaust Grills Not in Place

drawing the supply air through the side of the building. Two fans are estimated to furnish the supply necessary for their branch; the third fan is a stand-by unit. Inlet ducts to the fans are provided with automatic motor-driven dampers which close when their respective units are idle.

EXHAUST FANS IN GROUPS OF THREE

The exhaust fans are in groups of three, one of which is a stand-by unit, and are situated, with regard to ventilating stations, the same as the supply fans. These fans are located in rooms into which the exhaust duct to that particular group opens. They are up-discharge, and force the air from the room out through vertical flared stacks which discharge at the top of the buildings. Like the supply fans, the exhaust stacks are equipped with automatic motor-driven dampers which prevent air being drawn through the exhaust stack of an idle unit.

All fans are chain-driven; an arrangement which permits the re-adjustment of speed or the replacement of the power unit in a relatively short time. The driving units are electric motors drawing their power from the city supply. The maximum speed of any fan is 420 R.P.M.; maximum horsepower required, 179; maximum chain width, 13 in.; maximum pitch, 1½.; and maximum chain-speed, 1800 feet per minute.

AIR FLOW IN TUNNEL

The sections of the tunnels under the roadbeds form the supply ducts, which are of concrete, with a smooth sidewalk finish. The supply ports, which connect to the ducts, open along the curb at about the level at which motor gases are exhausted. The ports are equipped with adjustable face-plates which are set to provide a velocity of 1000 ft. per minute. It is estimated that this velocity is great enough not to be backed up by the pressure from passing vehicles, and yet not so great as to unsettle the dust of the roadway.

The exhaust ports are located in pairs at 15-in. intervals in the ceiling of the tunnel and open into the exhaust ducts which are formed by the section between the ceiling and the perimeter of the tube. These ports are made of cast-iron and slope in the direction of the air flow, forming an angle, roughly, of 45° with the duct. The ports are equipped with zinc slide regulators and bronze grills of considerably larger area than that of the port. The latter peculiarity of design was adopted to discourage the use of the ports as targets for cigarette butts.

DETAILS OF SUPPLY SYSTEM

The supply system provides 165 cu. ft. of air per minute on down-grades, 225 cu. ft. per minute on level roadway, and 295 cu. ft. per minute on up-grades. The total air supply is 3,761,000 cu. ft. per minute, producing an air change every 85 seconds. The maximum pressure required in any duct is 3¾ in. of water.

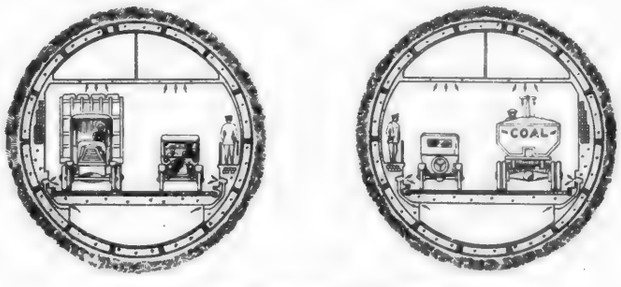
As has been shown in experiments, the fresh air flows out at the level of the vehicle exhaust, diffuses the motor gases, and is induced upward by the draft at the rear of the vehicle. Above the traffic the mixture is drawn through the exhaust ports and into the exhaust air system. In this way the exhaust gases pass the breathing zone once, whereas, if the air were supplied from the top and exhausted at the bottom, gases induced upward by the natural draft of the moving cars would mix with the fresh air near the top of the tunnel and cross the breathing zone a second time before being expelled. Moreover, in case of fire, the fumes would be forced down into the breathing zone, instead of being carried directly off.

Experiments to determine the air change required for automobiles in motion have been conducted for a number of years under the supervision of the United States Bureau of Mines.* Tests to determine the quantity of carbon monoxide given off under various load and speed conditions were made in an abandoned mine near Pittsburgh.

Other tests were made at Yale University to determine the percentage of poisonous motor gas that would constitute a menace to health. It was determined that more than four parts of gas to 10,000 parts of fresh air would be dangerous. From the results of these two experiments, and estimates of the amount and kind of traffic passing through the tunnel, it was possible to calculate how much fresh air would be required to make the tunnel safe from effects of gases.

Final tests have been made at the University of Illinois, where experiments were conducted to check the conditions by constructing a miniature tunnel reproducing the conditions of the one under the Hudson. It is believed that the atmospheric conditions in the tunnel, when traffic is admitted, have been predetermined with mathematical accuracy.

The construction of the tunnel is by the New York State Bridge and Tunnel Commission, and the New Jersey Interstate Bridge and Tunnel Commission, which have jointly conducted many preliminary experiments to find what the conditions will be when the project is completed.



Typical Section of Tunnel

*See The Heating and Ventilating Magazine for April, 1918; May, 1921; December, 1921; and May, 1922.

Vital Issues in Industrial Unit Heating

High and Low Outlet Velocities and Relative Advantages of Floor-Mounted and Ceiling-Mounted Units the Principal Bones of Contention

DETAILS of the discussion which followed the presentation of Thornton Lewis's paper on "Observing Warm Air in Circulation" before the American Society of Heating and Ventilating Engineers, at its semi-annual meeting in Lexington, May 26-28, as published in the *Journal* of the society, indicate how live a subject unit heating has become where heating and ventilating men are gathered together. For instance, in a written discussion, F. J. McMorran of Pecco, Inc., St. Louis, stated:

"The use of unit heaters for industrial buildings has taken its rightful place in the industry. Needless to say, there have been installations made which were not successful in maintaining satisfactory conditions. These failures have been due to disregard or misunderstanding of the basic principles involved in the application of the unit heater system.

"It is well to bear in mind at all times the fact that the result desired is air at the proper temperature in the working zone and that uniformity of temperature is secured by movement of the air.

"If a number of blocks are piled up one on top of another we have an arrangement similar to the air condition existing in a building; each block representing a stratum or level of air. Then by removing the bottom block, putting it on top of the pile and repeating the operation we see that the block originally on top passes down through the various levels to the bottom. The floor-type unit heater, taking air at or near the floor level, warming it and discharging it out above the working zone, is therefore, the logical arrangement and complies with the natural movement of the air. This, then, leaves us only the discharged air to control for horizontal travel and distribution.

"The tests on which Mr. Lewis based his paper show very clearly the necessity for comparatively high discharge velocity and a slight downward pitch of the air stream. I have known cases of faulty distribution being traced to horizontal air discharge and being corrected by giving a slight downward pitch to the outlets. In these cases we also maintained sufficiently high outlet-velocity. The degree of pitch necessary varies inversely as the outlet velocity, but high velocity is absolutely essential for maximum distribution and prevention of interference by roof or ceiling construction.

EFFECT OF ROOF CONSTRUCTION

"This question of the effect of roof construction is very important. High roofs, or those of monitor or saw-tooth construction, have a decided tendency to interfere with the distribution. Roof trusses also act as screens which form pockets and hinder distribution. High discharge-velocity will effectively overcome these influences and has done so in numerous installations. With 1000 ft. outlet-velocity we have secured good distribution over distances up to 150 ft. from the heater, with several intervening monitors in the roof and the accompanying trusses below the roof.

"The distance over which the air can be spread horizontally seems to be between 10 and 15 ft. for every 100 ft. outlet-velocity. This is based on approximately 135° outlet-temperature, and apparently higher outlet-temperatures decrease the area that can be covered because of the greater tendency of the air to rise to the roof. The foregoing statements refer to floor-type heater installations maintaining a flow of air off the floor. Ceiling-type units, drawing air from the upper levels, increase all the hazards due to roof construction and the natural tendency of the heated air to rise. It is also desirable to discharge the air in well-defined form, as from a pipe or an elbow.

ECONOMY OF USING LARGE UNITS

"Knowing that large areas can be effectively covered, then the logical use of heaters is in large units because of the resulting economies. It is practical to build units having capacities up to 2,000,000 B.T.U., with air entering at 60° and steam at 5 lbs. pressure. The floor-type unit, taking the air off at the floor level, is seen to have decided advantages in the matter of circulation and distribution. In addition, it has a greater heating capacity for a given heating surface and air volume because of its air being taken in at a lower temperature. A unit taking air off the floor at 60° has 10% greater heating capacity than it would have if mounted near the ceiling where it would take in air at 75°. Tests indicate that in the average industrial building the temperature at the ceiling would exceed 75° if ceiling-type units were used."

F. R. Still, vice-president of the American Blower Company, made the frank statement that: "If there is one thing more than another for which the Society has attained notoriety, it is the apparent difference of opinion among its own members on many phases of engineering relating to the heating and ventilating of buildings.

"While the paper submitted by Mr. Lewis is an interesting contribution to the records of the Society, and while some of the photographic cuts show quite clearly how air circulates with suspended units for both high and low velocities, also with floor-mounted, *high-velocity* units, he failed to show how the same results can be accomplished with floor-mounted, *low-velocity units*. Had he displayed photographs of the latter, the observer would have been unable to distinguish any difference in their appearance; therefore, he had to resort to line drawings with "trained arrows" to support his theories regarding the advantages of *high velocities*.

THE OBJECTION TO HIGH AIR VELOCITIES

"Of course, we all know the objections to high air velocities, the discomfort ensuing if a blast of air strikes us, no matter when, where or how. Even if it strikes a wall, column or some object in the room and is deflected onto us, it is quite as objectionable at high velocity as though it blew directly onto us, whereas air driven at low velocity avoids all such discomforts, and that is why most of the industrial heating units made to-day are low-velocity units. Any maker of such units is in a position to furnish either high or low-velocity types; if the high-velocity types had any such advantages as the author of the paper tried to demonstrate, it would be the most natural thing for all to furnish high-velocity outfits. Experience has shown that they are not alone objectionable, but they are likewise more costly to operate, besides accomplishing nothing that cannot be attained with the low-velocity type.

SMOKE TESTS DO NOT SHOW HEAT DISTRIBUTION OR DIFFUSION

"Smoke tests may show air motion, but they do not show heat distribution nor diffusion. A gas at high temperature is lighter, and being admitted to another heavier gas at low temperature, immediately sets about to equalize the volumes, thus distributing the heat according to the pressure of the atmosphere at different altitudes. In other words, the 'Law of Charles' applies here as well as in any other problem of the mixture of two gases.

"Air motion may quicken the diffusion of heat under some circumstances, but it never adds anything to the effectiveness of the distribution, except as to the length of time it may take to bring about certain results. Air motion also assists convection, which is recognized as more efficient than radiant heat. We commonly think of convection in its application to the passage of air over

heating surfaces, but it has a converse application by the air giving up heat to the cold surfaces of a building. This is why a building heats more quickly with air in motion than it does when there is no air motion.

"Many of the problems which the author mentioned during his talk while on the floor at the last meeting, but which are not referred to in his paper, were solved by high velocities only because the units were improperly placed. Infiltration has a lot more to do with the unsatisfactory heating of the lower portion of a building than anything else, and it has a greater effect on the results when the units are placed some distance above the floor than when they are near the floor. We have had experiences where no amount of velocity or heating capacity in the apparatus would effectively penetrate the *Neutral Zone*."

Henry Baetz, the designer of the original Baetz portable unit air heater, took a manifest satisfaction in hearing so much favorable comment on a method of which, for many years, he was almost the sole exponent. He congratulated the author on his paper and gave an account of the development of the floor-mounted unit heater in which he said natural laws are followed with the aid of a fan to obtain an even distribution of temperature.

"The action of the fan," he continued, "not only assists the horizontal movements of the air discharged from the heater, but this moving air drags along with it the adjacent air, finally moving the entire body of air in a continuous but imperceptible manner.

LIKENS MOVEMENT OF AIR BODY TO MOVEMENT OF LIQUID IN CIRCULAR VESSEL

"How this movement of air body occurs may be demonstrated with a circular vessel filled with liquid. Let the liquid body be quiescent. Then insert an ordinary lead pencil and move it parallel with the circular wall. In a few turns the entire body will be in motion, and in complete harmony. The air in a room acts in exactly the same manner and on the same principle, in fact, the same action of air is more quickly responsive in following other air in motion than liquid would be. On the other hand, let us suppose that instead of moving the pencil in a continuous circle it is criss-crossed indiscriminately instead. The result would be that the body of liquid itself would remain largely quiescent and movement would occur only where the pencil touched, because the movement in one direction of the pencil would counteract the movement in another direction and such is substantially the conditions when numerous outlets discharge heated air in various directions.

FAVORS LARGE-CAPACITY HEATERS

"It is for that reason that a minimum number of large-capacity heaters will give far better results than numerous small ones scattered about. The question then comes up, How long a distance from the building wall to the heater would it be safe to depend on this movement of air, so that the desired temperature would be maintained? The answer to it is that it is impossible to state a specific limit in feet because that would depend on so many things which vary in every building.

"An installation where the distance is 300 ft. from the far wall to the heater has been operating for 20 years. In this room bench work is done and the temperature is even.

"Experience is what counts for everything in this matter of proper location for heaters, and as a general rule my preference is to discharge the heated air toward the exposed walls.

THE ITEM OF FLOOR SPACE

"In connection with unit heaters for industrial plants much has been said about floor space, and it seems to me the term 'floor space' has become a sort of catch phrase rather than representing a substantial fact. A successful installation of a unit heater must, in my opinion, provide for drawing the air from near the floor. If this is not done, while the job may work, it is my belief that it will not be an economical one for operation. When the heaters are high up in the air, with a recirculating pipe reaching down near the floor, little has been saved by elevating the heaters. I make the assertion that, properly installed, a floor type of unit heater will deprive the factory owner of less usable floor space than any other heating method, the apparatus of which is within the room, for with a floor space of 10,000 sq. ft. the heater will not take more than 10 or 12 sq. ft."

The main points brought out by Willis H. Carrier, who also participated in the discussion, were presented in THE HEATING AND VENTILATING MAGAZINE for June.

W. A. Rowe, chief engineer of the American Blower Company, took up several points which he discussed separately. The first point was that of maintaining a suitable temperature at the breathing zone. This, he said, seems to require the discharge of the warm air horizontally, as close to the floor as possible. The second point concerned the necessity for some means of recirculation to remove the colder strata of air at the floor line, in order that it may be displaced by the warmer air in the course of its circulation through the room. Mr. Rowe endorsed these two points, adding that experience has confirmed the correctness of each.

In regard to the third point, relative to the necessity of high outlet velocities, this, he said, has not been proven. Concerning that point, Mr. Rowe said, the use of a floor-mounted type, with recirculation, causes a noticeable movement of sensibly cool air at the floor line in the immediate proximity of the unit. If there are operators working close to the unit, the movement of air around their lower limbs is sometimes so noticeable as to be distinctly uncomfortable. This will even result in night sweating of the lower limbs. While, therefore, this method of heating, or recirculation, may be very satisfactory in buildings of relatively low occupancy, when it is used in more crowded quarters we have found the drafty condition can be immediately corrected by a reversal of the direction of air flow. This also results in a more uniform temperature in the vicinity of the unit, although it does not appear to make so great a difference at more remote distances.

This seems to fall in line also with the conclusion first mentioned in the paper, of the desirability of having a horizontal discharge as close to the floor-line as possible. When warmed air is discharged at a moderate velocity at the floor-line it imparts a most comfortable sensation of warmth on the feet of the occupants, and makes possible a lower average temperature of the building, with an equal sensation of warmth, for what we really aim to accomplish is warming the occupant, rather than the air of the room.

Mr. Lewis has opened up a very interesting subject, and one worthy of further investigation. It would be fortunate indeed if our own Research Laboratory could devote some of the time to it, so that we may learn the correct relative values to assign to the different factors involved. These might probably include, besides temperatures, air velocities and direction of discharge, the effects of room height, or the relation between point of discharge and the neutral zone of the room, together with the whole theory of air stratification.

Gas Companies Have Novel Advertising Plan

A scheme to encourage the use of gas for domestic purposes is being applied jointly by more than twenty-five manufacturers and organizations associated with that industry, according to *Fuel Oil* for July, 1926. A part of their plan is to construct thirty-six model houses fully equipped with gas appliances. Besides gas stoves and water heaters, these models will be fitted with radiant warmers and incinerators, and gas furnaces.

Twenty-eight cities: New York, Boston, Philadelphia, Baltimore, Atlanta, Buffalo, Washington, Pittsburgh, Detroit, Louisville, Memphis, Cleveland, New Orleans, St. Louis, Houston, Chicago, Ft. Worth, Minneapolis, Des Moines, Omaha, Kansas City, Denver, Salt Lake City, Seattle, Portland, San Francisco and Los Angeles, are mentioned as the locations for these new homes. About three hundred gas companies throughout the country have already advertised special rates for the use of gas in domestic heating. This, with the carrying out of these new developments, is expected to bring about a substantial increase in the sale of gas for domestic purposes.

Correspondence

Conducted by T. W. Reynolds

A Problem In Boiler Design

EDITOR HEATING AND VENTILATING MAGAZINE:

I wish to thank you for the kind and helpful answer to my inquiry as published in THE HEATING AND VENTILATING MAGAZINE for May, 1925. I have been a subscriber to this magazine for a long time, finding it always in the forefront in up-to-date heating practice, as well as helpful and inspiring to further efforts along research lines.

A short time after my inquiry was made I found the trouble. Feeling that you would appreciate learning how the problem was solved, I am writing you the results of my experiments. It cost me money to learn a lot about round boilers, but I would rather have the expense upon myself than upon a customer. After all, the most cherished and useful knowledge is that for which we have paid.

The boiler works well, now that I have removed the cause of the trouble, by providing more steam space. I would also say, by way of information, that the full area (3 in.) of the one steam outlet was used, that the grate is 18 in. and that the steam dome measures 5 in. clear inside, leaving but 2½ in. of steam space when the water-line was fixed, as formerly, at the manufacturers' level.

By opening the return line at vent just above the boiler I noticed that a heavy flow of water rushed down the return and into the boiler whenever the fire burned with sufficient intensity to generate steam. At such times the pointer on the gauge would quiver violently and run up to ½ lb. or more of pressure. Still the radiators were only partially hot, not half heated in a number of cases, and no increase in pressure, at least up to 2 lbs., would make them heat. Water would leave the gauge and water from the boiler would rush up into the steam main, partially blocking the entrances to branch pipes, in some cases practically closing the total area of such pipes. The system circulated more as a hot water system, not like steam or vapor, that is, the circulation was from the boiler up, into and around the steam main and back through the return, without heating the radiators in the proper manner.

EXPERIMENTS IN LOWERING WATER LEVEL

Making allowance for the three intermediate boiler sections and dome, I found by progressively lowering the water level that the rush of water through steam and return mains became less and less. Eventually, I discovered just the right level for the water, the point at which no amount of forcing would cause water to be thrown into the steam main and so prevent circulation of steam. I then lowered the water glass so that this level could be seen and not guessed at, and was thus enabled to raise or lower the water level to any height at my pleasure. Each experiment, and I made a great many (perhaps fully one hundred), indicated that the steam space must not be less than 5 in. Above this level a fluttering of the regulator became evident. This occurred even with a few ounces of pressure, or, for that matter, at 1 oz. or less, the regulator working at pressures of 1 oz. or more. I found that this peculiar action of the regulator was due to splashing of water from the dome into the pipe leading to the regulator.

These conditions were observed through a 1¼-in. safety valve opening at a time when so little vapor was forming that the agitation or throwing up of the water was quite evident. One can infer from this fact just how easily the throwing up of water particles took place and how little pressure was required to produce this condition. The boiler seemed to breathe with a rhythmic geyser-like action, the water rising somewhat to release vapor and then falling in volume.

The boiler is of the two-nipple type, with nipples at the sides—the water sheets in the intermediate sections very thin. The water in an effort to get from the middle of the sections into the nipples and from thence upward into the steam dome would sizzle, hiss and foam and be ejected in spurts shooting up into the steam space of the dome, then dropping back again to be reheated would repeat the process.

If provision were made in the center of the flat sections for the heated steam and water to rise directly into the dome there would probably be established a definite downward flow through both side nipples, a real circulation instead of the former fighting and struggling of upward and downward currents in the same passages, the side nipples. This trouble must be common to almost all round boilers and can only be made less evident by steam domes of sufficient depth to prevent the spouting combination of water and steam mixture from reaching the nozzles or outlets.

I realize that the use of full-size outlets to point of main take-offs will help, providing two mains are used. I have also learned that it is good practice to run one of the mains up, then down, so as to form a loop connecting with the return outlet at bottom of the boiler, thus allowing the water to return back into the boiler, instead of being carried up into the steam main. For the best results from this arrangement the steam main must connect to the loop at right angles and at a point not less than 6 in. below the top of the loop, thereby allowing the water to drop without impediment into the bottom of the boiler, while permitting steam to flow into the mains.

I realize the effects of dirty water and the other things mentioned in your reply, all of which is expert advice. I also appreciate the inability to quickly perceive that a steam dome should be so shallow, especially with a round boiler of the usual type, due to the inherent difficulties which such boilers must overcome in circulating without having the up and down currents fighting against one another.

SUGGESTED CHANGES IN ROUND BOILER DESIGN

I am of the opinion that round boilers can be made to circulate water as well as the sectional or steel type which is said to have the best circulation of all, but instead of flat sections the sections must grade up not less than 22½° so that circulation will start quickly. There must be provision by some arrangement, nipples or otherwise, for the water, vapor and steam to move directly up to the steam dome by way of the boiler center, thereby leaving the outside nipples for downward circulation, because, under normal conditions, circulation will start first from the center of the crown sheet, the point where heat strikes the hottest.

It is more difficult and expensive to make round boilers this way, nevertheless such boilers will not become an unqualified success so long as there remains no provision for proper circulation. Great improvements would result from the use of center nipples even with the perfectly flat sections that now prevail, but a third outside nipple would not amount to much when used with such sections. Of course, the two remaining nipples would not have to carry such a load of foam, water, vapor and steam; nevertheless, the up-and-down currents would still travel in the same passages, each striving against the other. What is really needed is separate circulation passages combined with a steam dome of sufficient depth.

The ideal for a round boiler, or, for that matter, any boiler, is depth of dome, passages for circulation arranged so as to prevent the currents of water, vapor and steam from reversing one another, and connections from boilers to mains designed for delivery of dry steam at the radiators. Separators would have no place on such a job.

I realize the difference between theory and practice. Commercial considerations founded upon competition create

practices which result in trouble. In most cases the customer wants the cheapest he can get and never begins to investigate until trouble arrives. Not being an expert, more than likely when he does investigate he will wind up by buying a boiler recommended by his friends. Incidentally, my experience has been that the troubles as described were not altogether peculiar to round boilers. In some cases, the same difficulties are encountered in boilers of the square type.

Scranton, Pa. WM. LA FONTAINE.

There is no doubt that the steam space originally maintained was too small in amount and that this was largely, if not entirely, the cause of the trouble. The dome is correct for the size of firepot given, but the so-called manufacturer's water level departs from the usual elevation, which is near the bottom of the dome, thus leaving in most round boilers of this size a steam space of 5 or 6 in. There must have been a misunderstanding somewhere regarding the manufacturer's level.

So many complaints are received of unsteady water-line in boilers that it becomes a pleasure to suggest some cause other than dirty water, if only for the sake of variety. Nevertheless, the lowering of the water-line as described does not prove the non-existence of unclean water—dirty water may still be present yet not prime to the same extent because of the increased amount of steam space. Steam of the same quantity must increase in velocity in order to pass through a smaller space; therefore, a given quantity of steam, in leaving by boiler outlet, will pick up more water, whether clean or dirty, the higher the water-line. If the water is dirty the trouble will be aggravated. As pointed out in the inquiry the same trouble had occurred in square boilers as well as in boilers of the round type.

It is important under conditions, favorable or otherwise, that the main or mains be taken off from the top of boiler header and that the full area of all boiler outlets should be utilized by leads rising from outlets and dropping to the dripped header. It may also be pointed out that to visualize the conditions described through a small opening in the steam dome is quite difficult, as there is always some vapor present, no matter how slight the steam pressure may be.

There is a considerable difference of opinion regarding the relative merits of one-, two- and three-nipple construction in upright boilers. Quite often, such boilers work, or don't work, irrespective of the number of nipples used. Each type has its good points.

One point often stressed is that it is not the number of nipples that increases the circulation so much as it is their location with respect to the natural circulation of the water. Advocates of the one-nipple construction claim a large area for circulation at a point where the upward convection currents tend to be most active, the lone nipple being placed directly over the center of the fire, at which point the fire is hottest. Counter currents need not interfere if the nipple area is large enough. For example, the steel fire-tube boiler might be considered as one large nipple, yet no better circulation could be desired.

Some manufacturers use one nipple, others three, and some use both two or three, charging an additional price for the "more costly to build" three-nipple boiler. Generally the practice is to increase the area of the nipples as their number is decreased, so that the ideal would seem to be a combination of total nipple area with a number of nipples placed where circulation naturally takes place.

In passing, a word of appreciation is due the correspondent for his reply by way of a realistic sketch of the oft occurring fluctuations in boiler water line. If only more of those who write in would co-operate in this respect it would be more to the advantage of both reader and correspondent.

High-Pressure Versus Low-Pressure Boilers for Schoolhouse Heating

EDITOR, HEATING AND VENTILATING MAGAZINE:

The subject of heating large school buildings by low-pressure boilers versus heating by reduced steam pressure from medium high-pressure boilers often causes considerable anxiety to school boards, particularly as to the merits of either or both types of plants as relates to operating efficiency, maintenance and first costs. Claims are being made by parties throughout various sections of the country to school-board officials that steam heating and ventilating systems can be and are operated with greater efficiency and with less fuel consumption in any school building, regardless of class-room capacity, by low-pressure steam boilers operating on not to exceed 10 lbs. pressure than with medium high-pressure boilers generating steam at 35 lbs. and reducing the pressure through reducing valves to 2 to 5 lbs. pressure into the building heating system.

The aim of the engineering profession should be to encourage the proper installation of heating and ventilating systems of the highest standard of proved efficiency, together with yearly maintenance costs, particularly the boiler plant, as this is the heart of the heating system.

The question is, which is correct practice?

The writer agrees that heating and ventilating plants for school buildings of size not exceeding forty class-rooms equivalent can be and are economically operated with low-pressure boiler equipment, but is not convinced from experience that large high schools or junior high school buildings of greater capacity than forty class-rooms can be as economically heated with low-pressure boiler equipment as with medium high-pressure boiler equipment, and would therefore be pleased to have you bring this subject up in your magazine so that your readers may express their experience with plants of large sizes, together with their opinion of low-pressure versus high-pressure boiler equipment for large school buildings as relates to efficiency and economy in operation and amount of yearly repairs.

In this respect the writer refers to schools heated and ventilated either by the straight blast system or split system, using Vento or pipe coil heaters for heating the air for ventilation, and direct radiation in the rooms to offset leakage losses. The boiler in the low-pressure plant to be either cast-iron sectional, portable steel fire-box or brick-set horizontal-return tubular type, with safety valves set at 10 or 15 lbs.; in the medium-pressure plant, the boilers to be of brick-set horizontal-return tubular type, with or without stokers, and with safety valves set at or above 35 lbs. pressure.

In either design, steam must be generated to heat the building and to produce this required amount of steam a given amount of coal must be consumed. Now, if this steam can be raised to 35 lbs. pressure, instead of only the 2 or 5 lbs. usually carried on low-pressure heating systems, there is a tremendous amount of energy available which can be turned into heating power by passing the steam through regulating valves with no loss of the heating capacity of the steam. The type or design of the steam-distributing system outside of the boilers is the same in either case, that is, it is designed to operate on steam pressure varying from 2 to 5 lbs. or the pressure necessary to produce satisfactory steam circulation for heating.

EFFECT OF HEAVY CONDENSING LOAD WITH LOW-PRESSURE BOILERS

The modern school building of to-day is designed with more or less extensive ventilating systems, as well as direct heating, which puts a heavy condensing load on the system, especially when the building is being brought up to temperature or at times of extreme cold spells, whereby a large drop in pressure can be expected. With low-pressure boilers this drop is very noticeable and, in many cases, the pressure has been known to disappear entirely, causing considerable anxiety to the operating man of the plant. With high-pressure boilers, operating at 35 lbs. pressure and reducing through regulating valves, the boilers then become a storage space for steam at light demand and can be drawn upon at these peak loads or other times when needed, with no noticeable or dangerous drop in pressure.

It should go without saying that interruption of heating ought not to be carried so far as to involve the subsequent forcing of fires, which might quickly offset the economies attempted.

Ample apparatus in boilers, as well as type of plant, is a distinct advantage in this respect. The capacity and type of heating boiler plants, the writer believes, should be determined largely with a view to ready reheating and responsive service generally.

OPERATION OF BOILER AUXILIARIES AN IMPORTANT FACTOR

With plants designed at 35 lbs. pressure operation, the boiler auxiliaries, such as vacuum pumps, boiler-feed pumps and stoker engine (if stokers are used), can be operated by steam from the boilers with a loss of only a very small portion of the heating capacity of steam needed for these units, as after passing through the cylinders of these units about 95% of the original heating value of the steam is available in the exhaust steam at 2 to 5 lbs. pressure for heating the building or hot water tanks; i.e. the motive power available is obtained at practically no cost to the plant, whereas, in a plant designed at 15 lbs. or less operating pressure the boiler auxiliaries must by necessity be operated by electric motors, the power consumption of which must be charged to the operating costs of the plant, that is, the coal pile.

Generally speaking, it is cheaper in first cost to install a boiler plant designed for 15 lbs. maximum operation than a plant designed for 35 lbs. operation. However, in large installations, of the size which the writer has in mind, it is quite evident that the operating costs will be in excess of the saving in favor of the low-pressure plant first costs, besides the satisfactory results obtained by properly-designed and applied plants surely warrant careful consideration.

There need be no concern for the safety of a high-pressure plant (35 lbs. pressure) in a school building. High pressure can be, and is, made as safe as low pressure, while greater and more numerous safeguards are required to prevent even the possibility of accident. Objection to a school plant operated as above is sometimes urged as unsafe and inefficient. Both of these charges, the writer believes, are unfair to properly designed plants.

Repairs incident to either type of boiler installation when handled by conscientious employees will be about equal.

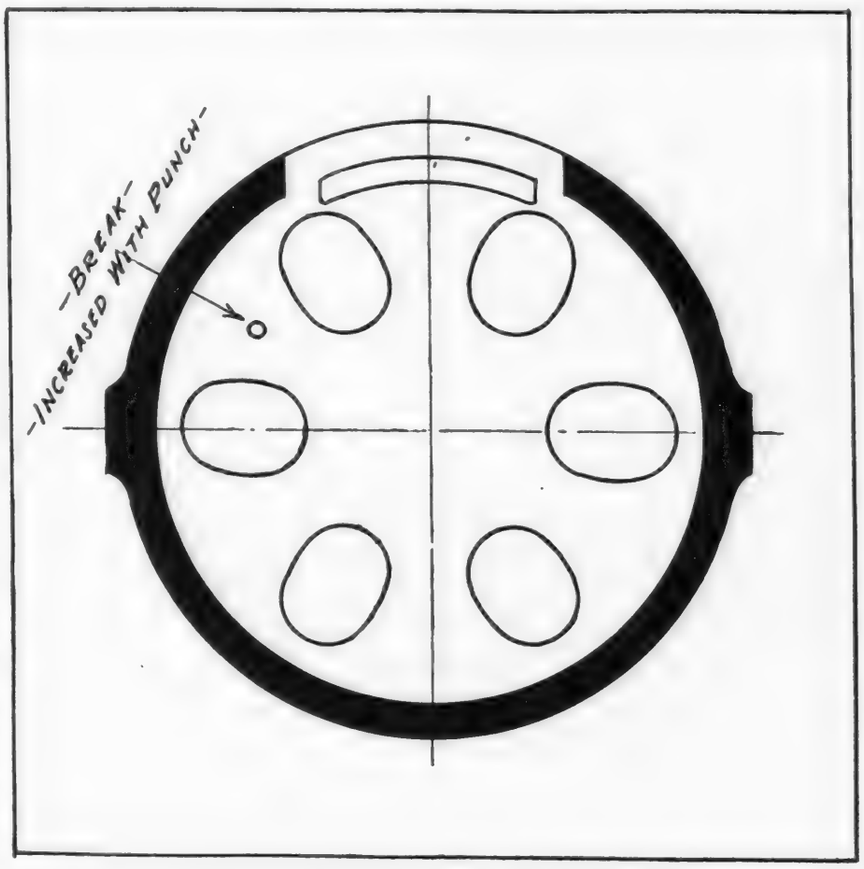
Cleveland, O. F. H. VALENTINE.

Cause of Leak in Boiler Casting

EDITOR HEATING AND VENTILATING MAGAZINE:

We have been asked to decide a question of boiler breakage in a residence having a heating system under pressure. The owner was informed that the trouble was caused through failure of the relief valve to function, a point disputed by the manufacturer's engineer because of the nature of the break.

The leak occurred in the crown sheet, directly over the fire, at the point indicated in the accompanying sketch of the 22-in. fire pot. This leak was repaired temporarily by a steamfitter who drove a steel chisel or punch into the opening or break. Though the owner stated that originally he could not get his little finger into this opening, the engineer found upon inspection a hole of at least ¾ in., surrounded by metal of at least ⅜-in. thickness. Based upon this condition the engineer decided that the casting, originally weak at this point, had been further weakened by five years of service, hence the break could not have been caused by excess pressure.



Location of Break in Crown Sheet of Boiler

In your opinion would it be possible for the casting to stand a pressure great enough to blow a hole of ¾ in. through its body without cracking, considering that the casting was perfect in construction as a whole and guaranteed as a part of the boiler to withstand a working pressure of 30 lbs.? On the other hand, if the casting was perfect would it be possible to drive a steel punch into a hole that was approximately ⅝ in. and then expand this hole to at least ¾ in. without cracking the casting?

What is the nature of breaks due to excess pressure on cored castings of perfect construction?

QUINN-TERRY PLUMBING & HEATING SUPPLY CO.

Chicago, Ill.

Probably a sand hole or, possibly, a blow hole which would stand a hydrostatic test, but would slowly have the sand cleaned out under operation and finally show a leak. Driving in of the punch probably broke away the thin metal, leaving the larger hole mentioned. This could be repaired by tapping and screwing in of a plug, then inserting some anti-leak liquid in the boiler.

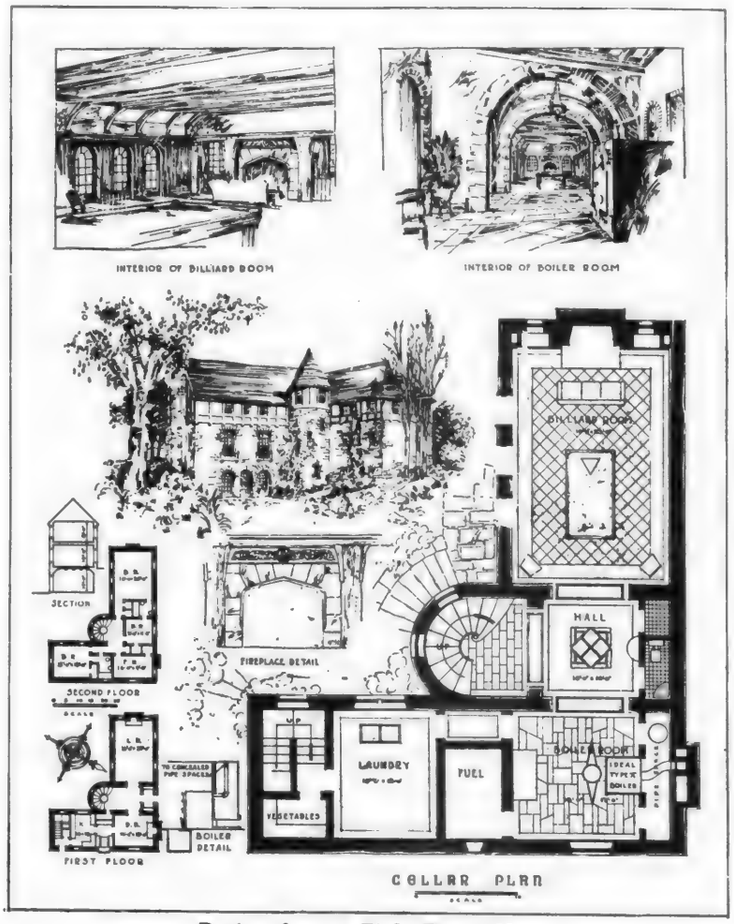
Boiler fractures due to defective castings are rare, probably but a small fraction of 1% of the entire output of castings. More usually they come about from many other causes, such as dropping of castings from wagon or truck, rough handling somewhere between factory and delivery point, wedging and undue stress of castings piled one on top of the other, undue stress on port hubs because of sections assembled with push nipples not squarely entered in the nipple ports, or connection of cold water pipe direct to the firepot.

Low water-line is also a frequent cause of cracks in castings and this may result from false registration in the gauge glass where the latter is clogged with sediment, emptying of the boiler while under fire with steam valve closed and valve on checkless return open, leakage from corroded pipe or freezing of piping, especially liable in an underground pipe, or wastage from steam traps to sewer where there is no automatic water feeder to maintain a normal water line.

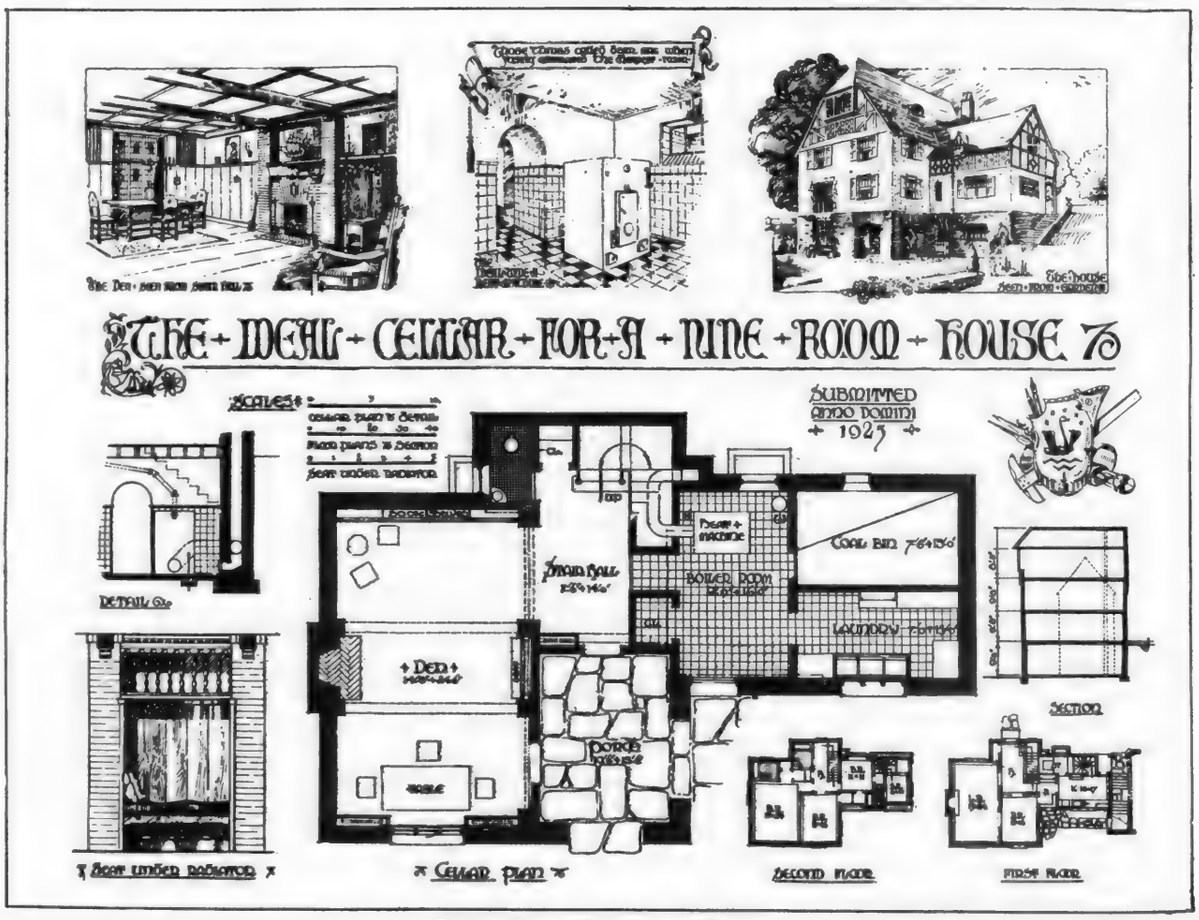
Making the Cellar Habitable

FOR some time manufacturers of heating equipment and architects have been jointly interested in the utilization of basements for living purposes. Two things have contributed much to this interest,—the development of domestic heating plants with an eye toward cleanliness of operation, and the knowledge that the basement of a home may be made a very attractive and pleasant part of the house.

In the interest of this development, the American Radiator Company recently conducted in the *Architectural Forum* a contest for the design of cellars for eight, nine, ten and fourteen-room houses equipped with the American Radiator Company's Ideal Type A boilers. These designs, which are distributed by the American Radiator Company, are interesting for their arrangement of rooms, their plans of construction of walls and floors and their method for making the heating unit conform to the plan of decoration.

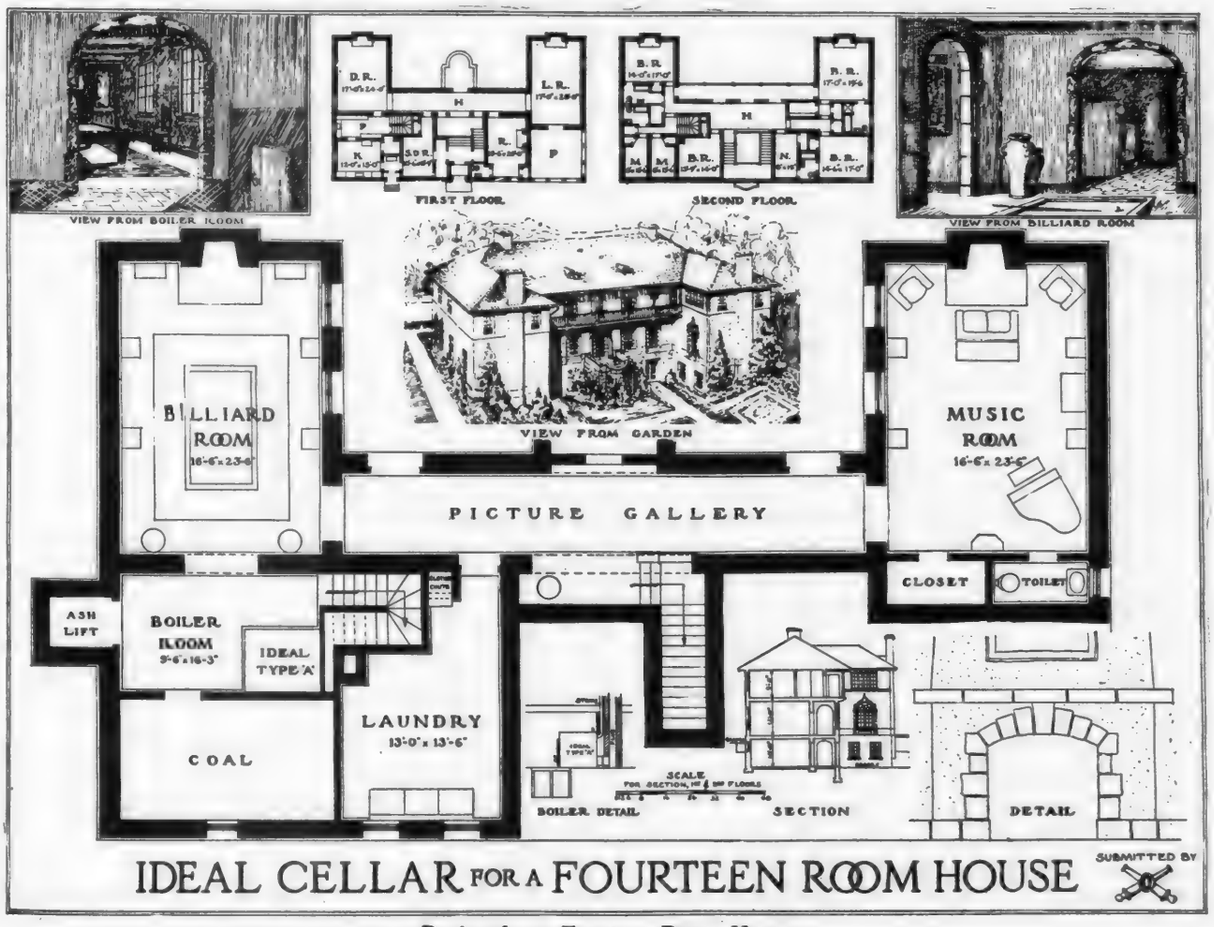


Design for an Eight-Room House
Submitted by E. W. Buenger and Edwin Larson, St. Paul



Design for a Nine-Room House
Submitted by Alfred Kastner and Harry Bosworth, New York

Design for a Ten-Room House
Submitted by Paul S. Hodgson, Ogden, Utah



Design for a Fourteen-Room House
Submitted by Leonard P. Botting, Brooklyn

Convention Photograph of the National District

Movement Inaugurated to Broaden District Heating Market

UNDER the title of "Manufacturers' Division" of the National District Heating Association a movement has been inaugurated by the associate members of that organization having as its object the extension of district or central steam heating so that, thereby, a broader market may result for the products of manufacturers in that field.

The plan has the approval of the executive committee of the National District Heating Association and was the subject of many informal discussions at the recent annual convention of the association in Niagara Falls. Nothing for publication, however, was given out at that time.

A formal organization meeting was held at Niagara Falls, on the last day of the convention at which representatives were present from over a dozen of the leading manufacturers of district heating apparatus.

It was decided at that meeting to call the new organization the "Manufacturers' Division" of the N.D.H.A. Officers elected are: President, Arthur J. Slade, director of sales, American District Steam Co., North Tonawanda, N. Y.; vice-president, W. K. Abernethy, manager Chicago district, Central Station Steam Co., Detroit, Mich.; secretary-treasurer, H. R. Wetherell, president Nitrose Co., Peoria, Ill., and technical secretary of the National District Heating Association.

An executive committee was elected, composed of the officers and including, in addition, C. Gottwald, president of the Ric-Wil Co., Cleveland, O.; J. Donald Pryor, manager, Department of Publicity and Promotion, Grinnell Co., Providence, R. I.; and J. C. Hornung, president, Central Heat Appliances, Chicago.

Active membership in the National District Heating Association is made up of such companies as the Detroit Edison Company, the New York Steam Corporation, Cleveland Electric Illuminating Company, and the Philadelphia Electric Company, all of which are directly engaged in the central heating field through the underground distribution of steam. The extensive work done by these companies means in the aggregate a demand for several million dollars' worth of products.

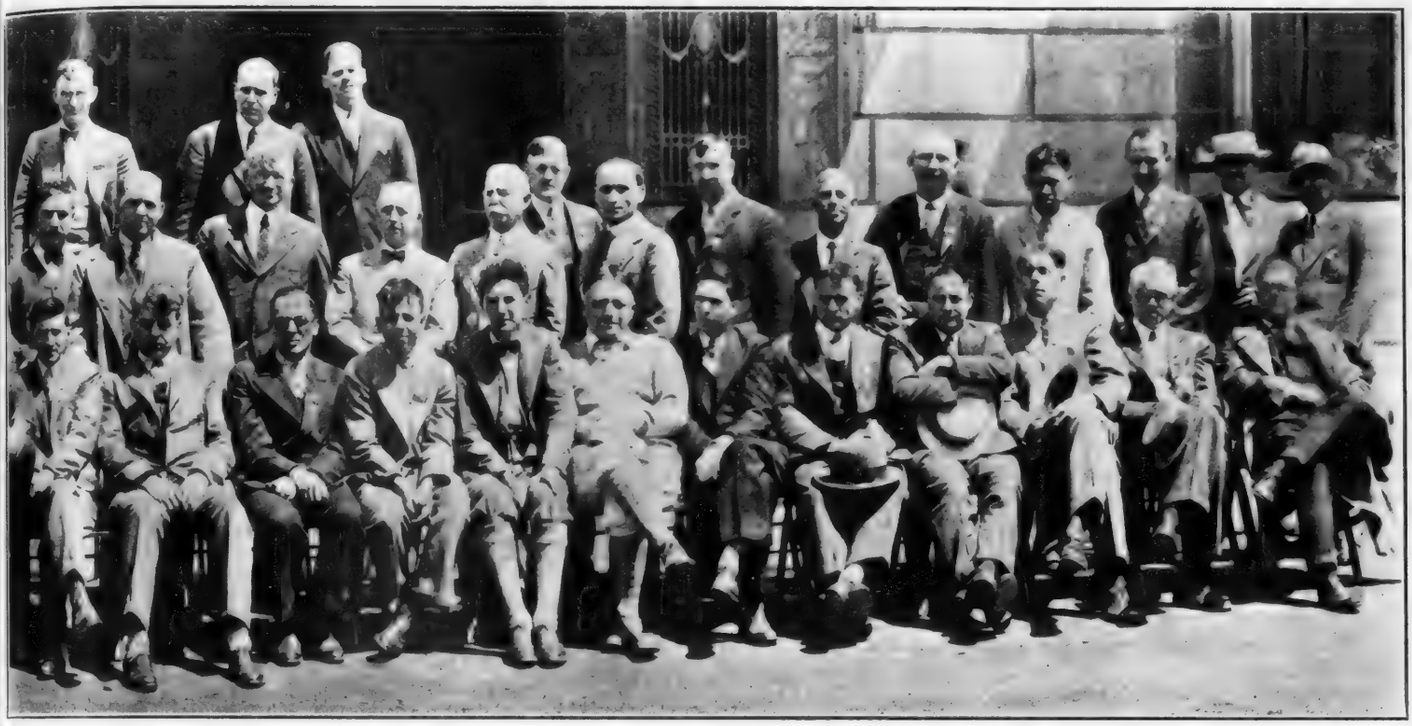
There still remain hundreds of cities of all sizes in the United States where no district heating service exists. This potential market for large boilers, boiler house piping and equipment, insulation, iron and steel pipe, valves and fittings, pipe covering, underground conduit, steam traps, pressure regulators, condensation meters, heat controlling equipment, heating specialties and all of those things having to do with steam heating and distribution, we say, the potential market for these products is almost beyond an intelligent estimate.

Active members of the N.D.H.A. are interested primarily in the successful operation of their own properties and have small reason to bend their efforts towards a broader application or development of district steam heating as a public utility in other cities. It was for this reason that the movement here described was started. Previous to the formal organization of the Manufacturers' Division, meetings were held at which separate committees were presented, representing the N.D.H.A. and the manufacturers, respectively. The joint committee carried on its deliberations under the name of "The Information Committee of the N.D.H.A." This joint committee will carry on under the name of "The Information Committee of the National District Heating Association." The active members are represented by L. G. Meyers, Pittsburgh, chairman; Charles H. Day, Cleveland; Roger De Wolf, Rochester, N. Y.; J. H. Walker, Detroit; and D. S. Boyden, Boston. Representatives of the associate members on the committee are: Arthur J. Slade, American District Steam Co.; C. Gottwald, Ric-Wil Co., Cleveland, O.; H. W. Coombs, E. B. Badger & Son Co., Boston; A. M. Moulder, Grinnell Co., Warren, O.; and J. C. Redfield, Central Station Steam Co., Detroit, Mich.

At the outset the Information Committee's work will probably divide itself into three divisions:

(a) Informing the executives and engineers of the electric utility field of the desirability of combining a district heating utility with their present service.

(b) Assisting existing heating systems to secure the maximum profitable load by popularizing the local service.



Heating Association, Niagara Falls, June 1-4

(c) Passing upon proposed district heating installations rendering unbiased opinions as to their feasibility.

This work will embrace addresses before electric conventions, the preparation and distribution of a number of bulletins, analyses of successful plant operations, studies of the advantages to the public of district heating, engineering reports on particular heating projects and such other publicity work as may seem advisable.

While the information committee as a whole assumes the work, the Manufacturers' Division has undertaken to meet the expense involved.

It is estimated that the total cost of the first year's program of work will approximate $6,000.

American Society of Heating and Ventilating Engineers

Committee Appointed to Compile Code for Testing Air Filters

President W. H. Driscoll, of the American Society of Heating and Ventilating Engineers, has appointed as members of a committee of the society to compute a code for testing air filters, Professor F. B. Rowley of Minneapolis, Minn., chairman; D. M. Forfar of Minneapolis, and Albert Buenger of St. Paul, Minn.

Massachusetts Chapter Election

Officers elected by the Massachusetts Chapter, at its May meeting, are: President, Davis S. Boyden; treasurer, W. T. Smallman; secretary, J. W. Brinton. Board of governors: Alfred Kellogg, H. B. Wiegner, D. S. Boyden, E. A. Dusossoit, Coll T. Flint and E. C. Whitaker.

Committee chairmen are: E. C. Whitaker, for meetings and papers; H. B. Wiegner, membership; Coll T. Flint, social.

The next regular meeting of the chapter will be held next October.

May Meeting of the Michigan Chapter

Twenty-five members and guests attended the meeting of the Michigan chapter at Meadowbrook Country Club, May 17. Officers elected for 1926-1927 are: President, J. F. McIntire; vice-president, M. W. Calvert; secretary, William G. Boales; treasurer, H. A. Hamlin. Directors: L. L. Smith, W. M. Foster, and G. H. Schildmiller. Retiring President Ray S. M. Wilde stated that he was well pleased with the support given his administration, and commended G. H. Walker, chairman of the Program Committee, for his work in arranging interesting and instructive meetings.

Golf was played at the club prior to the dinner and meeting.

Ontario Chapter

The Ontario Chapter at its May meeting, heard an address on warm-air furnace heating delivered by R. J. Miller.

Officers of the Ontario Chapter, as announced in June, are: President, A. J. Dickey; vice-president, R. W. McHenry; secretary, M. W. Shears. The board of governors consists of H. H. Angus, H. R. Flett and A. S. Leitch. The names of M. F. Thomas and C. J. Dowdy, which appeared in the June report as members of the board of governors, should have been under the heading of auditors.

Chapter Notes

The May meeting of the Illinois Chapter, which was also the closing meeting of the season, took the form of an outing at the Wilmette Golf Club, May 20. Thirty-three players turned out for golf and ninety-six more members and guests arrived for dinner and for the dance which followed. This attendance broke all records for the chapter's May meetings.

ENGINEERS' DATA BOOK is the name of a novel catalog received from the Autovent Fan & Blower Co., Chicago. The data book is made of four pages of blue-prints bound together, and contains a table of the principal dimensions and weights of the Autovent Unit heater, along with capacity tables, and sizes of steam connections. Chicago Master Steam Fitters' Association standards for computing radiation, and a list of heat transmission constants are given. Size 8½ x 11.

Data on Gas Piping, Flues and Appliances for a Small House

ANNOUNCEMENT of the awards in the competition for the best design for a small house, conducted by the American Gas Association, calls attention to the data furnished the competitors to assist in the planning of the layout of gas piping, flues and appliances. The information, consists of that part of the standard recommendations of the American Gas Association which was selected as being helpful in the planning of such a house.

Architects, draftsmen and students in architectural schools in the United States and Canada participated in the competition, and the report of the association states that 363 plans were submitted which, from their character, evidenced that the contestants were mainly men of skill, experience and originality. It is interesting to note that the first three prizes went to men in Cleveland, Ohio.

Here are some of the principal data included in the bulletin for the use of the competitors:

HOW TO CALCULATE PIPE LAYOUT

The size of gas pipe necessary to install depends on the following factors:

(a) Length of pipe.

(b) Maximum gas consumption to be provided for.

(c) Allowable loss in pressure from service pipe to appliance.

(d) Specific gravity of the gas.

The specific gravity of most gases varies between 0.45 and 0.65, and as the capacity of pipe is only affected by this factor inversely as the square root, it is sufficiently accurate to use an assumed gravity of 0.6 for all calculations. Tables 1 and 2 are both based on this value but, if it is desired to use the exact gravity for a particular condition, the values in the two tables can be corrected by multiplying by

$$\sqrt{\frac{0.6}{\text{Sp. gr.}}}$$

The unit for measuring the pressure of manufactured gas is inches of water, and it will be noted in Table 1 that the gas capacities for the various pipe sizes are given for a 0.2-in. pressure drop. In Table 2 the drop allowed is 0.5 in. These two tables are given in order to compensate for the different conditions encountered in calculating lateral feed pipes as against vertical or riser pipes. Table 1 is for laterals and Table 2 for risers. There are two reasons which permit a greater pressure drop to be allowed on risers. First, the drop in pressure due to the ordinary friction loss is reduced by the gas column, which is lighter than air and therefore causes an increase in pressure with altitude. For a gas with a specific gravity of 0.6 this increase is approximately 1 in. (of water) per 170 ft. of elevation.

MISCELLANEOUS RECOMMENDATIONS ON PIPING

Piping should not be laid under tile, parquet or mosaic floors where it is at all possible to avoid it. Piping should not be run to bottom of beams that are to be covered with lath and plaster, but should be run along top of beams or joists, where it is possible, so that it will be accessible by raising the floor boards, which, when covering such piping, should be fastened with brass screws.

All parts of gas piping should be securely and permanently fastened to or supported from the building itself. If this is not done, sags or undue strains may later develop and the piping may leak or condensation may accumulate in the low points of the sags and interfere with the free flow of gas.

All piping should slope toward the meter, or outlet,—condensation can then be removed if necessary. Meters will not be set in places where they are exposed to damp or frost or extreme heat. A "T" not "L" should be placed on cellar end of riser.

FLUES AND FLUE CONNECTIONS

If large gas-consuming appliances are to be installed in relatively small spaces, a flue or chimney connection is necessary. Further, gas appliances operating under automatic control should always be vented, as should all appliances installed in bathrooms.

Where flues and flue connections are necessary, these chimneys or flues should be of the same size as required for solid fuel appliances of equivalent capacity. As for design and material, the specifications of the National Board of Fire Underwriters should be followed. Smooth tile-lined flues are very satisfactory for venting gas appliances.

INSTALLATION OF APPLIANCES

All gas appliances should, wherever practical, be connected solid with iron connections. Plain rubber hose should in no case be permitted. Flexible hose, properly designed and approved by the proper authorities may, in certain cases, be used; but where so used, a stop cock should be placed near the supply pipe.

Gas-consuming equipment should be adequately supported so as to avoid strains on the piping, connections, and vents.

Gas-burning equipment should be installed a sufficient distance from combustible materials of any kind to prevent the heat from the gas flame from raising the temperature of such materials above 160° F. Ranges, water heaters and similar devices should be at least 6 in., and preferably more, from an unprotected vertical combustible wall. Combustible shelves should not be closer than 3 ft. above open gas flames.

Flue-connection pipes should be kept at the distances given above from combustible surfaces, except that the vertical distance between such connections and combustible ceilings should be at least 1 ft.

GAS-LINE COCKS AND VALVES

Wherever flexible tubing is used there should be a valve or cock at the inlet end so that when the gas is not being used the cock may be closed and the tubing relieved of pressure.

Cocks controlling several outlets from a gas line should be placed at a sufficient distance from each other to avoid the probability of turning the valve at

TABLE I—Capacity of Pipe of Different Diameters and Lengths in Cu. Ft. per Hour, with Pressure Drop of 0.2 In. and Specific Gravity 0.60.
To Be Used for Figuring Laterals and Service Pipes.

Length of pipe, ft.	Diameter of pipe, in.								
	¾	1	1¼	1½	2	3	4	6	8
15	168	350	620	960	2000	5400	11200	31000	63000
30	120	245	430	680	1400	3800	7900	21500	44000
45	98	200	355	530	1150	3200	6500	18000	36500
60	84	175	310	480	1000	2700	5600	15500	31500
75	76	155	275	430	890	2450	5000	13700	28000
90	70	145	250	395	810	2280	4550	12500	26000
105	64	132	232	370	750	2100	4200	11500	24000
120	60	125	215	340	700	1950	4000	11000	22000
150	54	110	195	310	630	1750	3550	9800	20000
180	49	100	175	280	570	1600	3200	8900	18000
210	44	94	165	260	530	1450	3000	8200	16500
240	43	88	155	240	500	1350	2800	7700	16000
270	40	83	145	230	470	1300	2650	7100	15000
300	38	79	138	215	440	1250	2500	6900	14000
450	31	64	112	176	360	1000	2050	5600	11500
600	27	56	97	152	315	860	1750	4900	10000

TABLE 2—Capacity of Pipe of Different Diameters and Lengths in Cu. Ft. per Hour, with Pressure Drop of 0.5 In. and Specific Gravity 0.60.
To Be Used for Figuring Verticals and Risers.

Length of pipe, ft.	Diameter of pipe, in.									
	¾	1	1¼	1½	2	3	4	5	6	8
15	270	560	980	1540	3200	8600	17800	31000	49000	100000
30	190	390	680	1080	2200	6100	12500	22000	34500	71000
45	155	320	560	890	1800	5000	10300	18000	28000	58000
60	135	280	490	770	1600	4300	8900	15500	24500	50000
75	120	250	430	680	1400	3800	8000	14000	22000	45000
90	110	230	400	620	1300	3500	7300	12500	20000	41000
105	102	210	370	580	1200	3300	6800	11800	18500	38000
120	96	200	345	545	1100	3100	6300	11000	17400	36000
150	87	180	310	490	1000	2700	5600	9800	15500	32000
180	79	160	280	445	900	2500	5100	8900	14000	29000
210	73	150	260	410	840	2300	4800	8300	13000	27000
240	68	140	245	385	790	2150	4400	7700	12300	25000
270	65	130	230	365	740	2050	4200	7300	11500	23500
300	61	125	220	345	710	1950	4000	7000	11000	22500
450	50	100	180	280	570	1600	3200	5600	8900	18000
600	43	88	150	240	490	1350	2800	4800	7600	15500

the wrong outlet and thus permitting gas to escape unburned. Such outlets should be placed in well lighted locations for ready access.

In buildings, line cocks in gas piping systems should always be used under the following conditions:

(a) Appliances of high rate of gas consumption, such as house-heating furnaces;

(b) Water heaters and other devices of the automatic instantaneous type;

(c) In apartment buildings where relatively frequent changes of gas ranges are likely to be made or where fixtures are fed from a gas line serving two or more apartments.

Ordinarily gas cocks of the quarter-turn type are better than the hand-wheel valve type, because of the possibility of using a stop pin for the "off" position and observing quickly the extent of the valve opening.

Richmond Radiator Company Adopts New Method for Rating Boilers

ONE of the first reactions to the efforts of the Boiler Output Committee of the Heating and Piping Contractors National Association is the publication, by the Richmond Radiator Co., 1480 Broadway, New York, of a new manual on "Engineering Data Concerning Boiler Efficiencies and Ratings." Data Book No. 1 is devoted to Richmond round boilers and Data Book No. 2 to Richmond and Model sectional boilers. In a foreword the manual characterizes the efforts of the Boiler Output Committee of the H. & P. C. N. A. as "the most important advance made in the boiler and heating industries for the past twenty years." There is no longer any reason, it is stated, for such a wide range of ratings for boilers of different makes of about equal size and type. The company announces its adoption and endorsement of the testing formula of the H. & P. C. N. A. as the best and fairest method ever presented for accurately determining boiler outputs. Hereafter the company's published ratings will be exact boiler outputs, that is, the exact amount of direct cast-iron column radiation the company's boilers will carry, in addition to piping uncovered, the boiler only being covered.

The company, as heretofore, will guarantee the efficiencies and ratings. Charts and data of the tests of every boiler have been filed with the Heating and Piping Contractors National Association. Special attention is called to the fact that the tests were not made by the company's own engineers in its own boiler plant, but in the Laboratories of Carnegie Institute of Technology, in Pittsburgh, and in those of Robinson V. Frost, Norristown, Pa., according to the code of the A.S.H. & V.E., and rated according to the rating formula of the H. & P. C. N. A. Furthermore, the ratings are based on anthracite coal of 12,500 B.T.U. heat value, instead of 13,000 B.T.U. value.

The Richmond boiler performance tables cover the items of firing period, fuel burned per hour, rate of combustion, efficiency of boiler, evaporation per pound of fuel, output at boiler outlet in B.T.U. per charge of available fuel, in B.T.U. generated per hour, and in square feet of radiation; net square feet of direct cast-iron column radiation at 80% of 240 B.T.U. per square foot per hour and similar data for water radiation at 150 B.T.U. per square foot per hour; flue-gas temperature leaving boiler, average draft tension at smoke outlet of boiler, average draft tension over fire, required chimney draft at smoke outlet at specified temperature and chimney dimensions and height.

Included in the manual is the A.S.M.E. boiler code, the A.S.H. & V.E. Boiler Code, H. & P. C. N. A. formula of output tests of heating boilers, together with the association's formula and data for computing radiation (reproduced in facsimile from THE HEATING AND VENTILATING MAGAZINE'S Standard Data Sheets No. 13-A2, 13-B2, 13-C2 and 13-D2); also the rules for Construction of Chimneys recommended by the National Board of Fire Underwriters' Committee on Construction of Buildings.

A section of the manual is devoted to the Richmond buckwheat grate and to special grates for 53-in. Richmond and 40-in. Model sectional boilers for use with small coal sizes. Size 7¾ x 10¾ in. Pp. 46.

Heating Contractors' Boiler Rating Resolution

IN view of the interest which has has been shown in the efforts of the Boiler Output Committee of the Heating and Piping Contractors National Association to solve the problem of rating house-heating boilers, the full text of the resolution adopted at the association's recent convention in Washington is given to show how fully the association is backing up its committee in this undertaking:

Whereas, it is highly desirable for all concerned to secure as soon as possible the benefits of a reliable and uniform method of selecting heating boilers, and

Whereas, the report of our Boiler Output Committee indicates that it will soon have in its possession the output data on a sufficient number of boilers to complete and perfect its method of boiler selection and be in a position to publish the necessary reference data on all boilers as rapidly as it is furnished by the manufacturers, be it

Resolved, that our Boiler Output Committee should publish at its early convenience the method of selection and such information as is necessary for its use in selecting all makes and patterns of boilers, on which complete data has been furnished by the manufacturers, in accordance with our Committee's plan. Also that it should from time to time supply the information on other boilers as the data may be furnished to them, and be it further

Resolved, that our members should adopt and follow the policy of promptly applying this new method of boiler selection to each particular make and pattern of boiler as soon as the data on that particular pattern are available through our Boiler Output Committee.

National Press Shrine in New York

America is to be the first country to dedicate a national shrine in honor of the press. This shrine is to be built by men and women of the profession in the Cathedral of St. John the Divine, in New York.

The shrine will take the form of a chapel, opening from the side of the great nave or central aisle.

The cost of erecting and equipping the chapel will be between $150,000 to $225,000.

Operation of Condensation Meters in Detroit

In discussing recent developments in district heating service in Detroit, at the recent convention of the National District Heating Association, J. H. Walker, superintendent of heating for the Detroit Edison Company, had some interesting comments to make on the development of the art of metering the customers service.

In Detroit only condensation meters are used. The number of meter tests made necessary by customers' complaints have been reduced to a neglible quantity, although the number of meters found slow or stopped is still too high.

Of the 1998 meters in service in 1925, stated Mr. Walker, 220 were found slow and eleven were found spinning. In a report of Mr. Walker's remarks, published in THE HEATING AND VENTILATING MAGAZINE for July, he was made to say that all of the meters were found spinning. This error will have to be blamed on the dictaphone. Incidentally, the fact that but eleven out of a total of 1998 were found spinning is a remarkable tribute to the operating characteristics of this type of meter.

Heating and Ventilating a School Without Direct Radiation

A PLAN for heating and ventilating Detroit public school buildings was described by J. R. McColl in a paper presented at the recent Lexington meeting of the American Society of Heating and Ventilating Engineers, and published in abstract in THE HEATING AND VENTILATING MAGAZINE for June. Discussion of this plan included the following written comments which appeared in the A.S.H. & V.E. *Journal* for July.

John Howatt, chief engineer of the Chicago Board of Education: "Heating of classrooms without direct radiation is a common practice in larger cities of the middle States where the all-blast system of combined heating and ventilation had its origin, the development in recent years having been in improved methods of carrying the air to the rooms and improvements in its distribution in the rooms themselves.

"The success of the all-blast system of heating and ventilation is dependent upon the successful operation of a heat-regulation system that is accurate and sensitive and which will maintain the mixing dampers in intermediate position without flopping. In order to avoid excessive quantities of air being delivered into the rooms with the mixing dampers thrown to the tempered air position, it is necessary to provide adjustable dampers or closing-off devices to artificially build up resistance through the tempered-air side of the system to equal the greater resistance through the warm-air side, due to the additional resistance offered by the heating stacks. This feature is frequently omitted in designs of ventilating systems of this type and the omission is one of the causes of complaints of drafts.

"My experience has shown that the most frequent complaint received against a ventilating system is complaint of drafts and if we are to design systems that are considered satisfactory, drafts must be avoided, particularly drafts that strike the occupants of a room on the back.

"In all of the discussions concerning the present methods of heating and ventilating school buildings, the critics of mechanical ventilating systems lay great stress upon the fact that many millions of dollars are invested in mechanical ventilating plants throughout the United States which are never used. They cite example after example where expensive mechanical ventilating systems have been provided in buildings by owners but which for reasons of economy or other reasons, are never operated.

THE ALL-BLAST SYSTEM AS AN ANSWER TO THE FAILURE TO OPERATE HEATING AND VENTILATING PLANTS

"This condition is never found where the heating and ventilation of the classrooms are combined as they are in the all-blast system. It is the system generally used in the Chicago schools and we have experienced very little opposition to the mechanical ventilation of our buildings, largely attributable, in my opinion, to the fact that it is absolutely necessary for the engineer in charge of the plant to operate his blower system whenever the outside temperature is below 60° in order to make the classrooms comfortably warm. It is a well-known fact that the temperature of the room is noticed by the teachers quicker than is any other air condition. With the air-blast method of combined heating and ventilation if the room is warm, it is also receiving ventilation.

"The cost of school building construction is receiving critical attention throughout the entire country and every way in which it can be reduced is being considered. The all-blast system of combined heating and ventilation is the lowest first cost system of mechanical heating and ventilation that has been devised.

DIFFERENCES OF TEMPERATURE IN VARIOUS PARTS OF ROOM

"There is no question that there is some difference in temperature in different parts of any room when outside weather conditions are severe. This is particularly true on the windward side of a building when the wind velocity is in excess of fifteen miles per hour and, of course, the difference in temperature is aggravated by poor building construction or loose window sash and window frames. However, I have never discovered more than 5° difference in temperature under the most severe conditions between the first row of seats on window side of the room, as compared to the row next the inside wall. That may be because, realizing the enormous losses through window cracks, we try to keep our window frames calked and window sash weatherstripped.

IMPOSSIBLE TO AVOID CHILLING EFFECT OF WINDOWS

"A chilling action of the window exists, however, under any circumstances and the conditions in the room are improved by providing a supply of heat under them. In the split system this heat is supplied by direct radiation. In the all-blast system it may be supplied, as proposed by Professor McColl, through slots in the window sills, or as has been done by Mr. Lewis, in other cases, by especially-designed baseboards with openings in their upper faces.

"As I see it, the big problem in ventilation not satisfactorily solved is distribution and that is improved by introducing some air under the windows on the outside wall, as proposed. We have experimented with this addition to the conventional arrangement for introducing air and have several buildings in operation with air-inlet registers in the wall just below the windows and find that room temperatures are more uniform than without them, but in severe weather it does not entirely overcome the difficulty. Double windows, which can be opened, have been found more effective.

PROPER CARE OF SYSTEM THE VITAL FACTOR

"I take this opportunity to stress what, I believe, is a most important factor in the success or failure of any mechanical ventilating system, and that is, proper care, maintenance and operation of that system after it has been installed. Two plants of a similar design may give entirely different results, one satisfactory and the other unsatisfactory, dependent upon the operator in charge of each. The attention given to the sanitation and cleaning of the heating devices and air passages, air shafts, washers, etc., has a great deal more to do with the results obtainced than most engineers realize.

"Dust settles on horizontal surfaces only. Very little, if any, will settle on vertical galvanized ducts. A great deal will settle in any horizontal duct. You would not think of filtering and purifying water, making it fit for human consumption, and then deliver it into dirty and unsanitary water mains. Neither should we think of cleaning and purifying the air, making it fit for human use, and then discharge it into filthy unsanitary ducts.

"In our mechanical ventilating design we should eliminate, as far as possible, all inaccessible horizontal air-delivery passages, as they are bound, sooner or or later, to become filthy and foul smelling. For this reason we have adopted for our Chicago school building designs the sub-corridor or tunnel system with vertical sheet-metal riser ducts to the classrooms. These sub-corridor tunnels being 14 ft. wide and 7 in. high, with smooth cement finish and hosed out every night, are easily maintained sanitary. We do not design a ventilating system that cannot be cleaned out easily and do not place the equipment in inaccessible places where it is difficult for the operating engineer to get at it in order to take care of it. If care and operation are not made convenient the equipment will be neglected and the heating and ventilating system will not give satisfactory results.

OPERATING RULES SHOULD PERMIT OPENING OF WINDOWS

"Operating rules that prohibit teachers from opening classroom windows should be avoided, as it is a human trait to oppose any compulsory measure. It is not necessary to have such a rule, provided the blowers used are selected

to give excess pressure in the plenum chamber, so that opening windows in one classroom will not interfere materially with the air supply to any other room. It is surprising how seldom windows are opened in a building that is ventilated by a good mechanical system where the teachers know they may open them if they desire."

SPLIT SYSTEM FAVORED IN MINNEAPOLIS

A. L. Sanford, mechanical engineer, Minneapolis Board of Education:

"It has been our experience, here in Minneapolis, with the extreme winter weather, often averaging 30° below zero for a week at a time, that the split system is the best type of heating which can be installed in our schools. We find that it is much easier, as well as cheaper, to keep the entire building above 50° at night, rather than allow the temperature to drop. With a fan-blast system in which all of the B.T.U. loss is taken care of by the temperature of the air, we find that the room cools off immediately after the fans are shut down, and it takes a long time in the morning to get them up to temperature again.

"It is very easy, with the blast system, to heat the air content of the room and building, but it is not so easy to bring up the temperature of the walls and furniture to a comfortable point. It is on that account that we are using the split system, and we try to maintain a temperature above 50° at night, even in the cold weather.

"The blast system, wherein a part of the air is delivered in front of the windows, is one which has been tried previously and I should not care to comment on this without having the drawings before me. This idea is one, however, which should work out very satisfactorily provided the operation is correct and the outdoor temperature does not reach an extreme.

"In the next-to-the-last paragraph of the paper, Mr. McColl states that in his system of ventilation, 'the row of pupils along the outside wall of the classroom did not suffer * * * from the radiant heat from radiators in the split system.'

"In the Minneapolis public schools we install a radiator shield which is located 2½ in. from the radiator. Also, the radiator is installed with a clear space of 2½ in. from the radiator to the wall. This gives, in effect, an enclosing box of the most efficient type around the radiator, insuring a maximum efficiency of the radiator, and also prevents any radiant heat from affecting the pupils next to the outside wall. So that this criticism of Mr. McColl's does not apply to a split system properly installed with radiator shields."

KANSAS CITY ALSO FAVORS SPLIT SYSTEM

N. W. Downes, engineer, School District of Kansas City, Mo.:

"The strong point brought out in Mr. McColl's paper in favor of the fan-blast system is the fact that the fan-blast system insures ventilation while the flexible split system does not when operated under lax supervision.

"Like Mr. McColl, the writer is of the opinion that the sentiment in favor of uncontrolled ventilation has grown up largely through failure to properly operate split systems, due not only to carelessness on the part of the operating engineer but, in large part, to faulty design and installation, making satisfactory results impossible.

"Our experience in Kansas City would indicate that properly-designed, installed and operated split systems operate more economically than fan-blast systems just as carefully designed, installed, and operated. At the close of school in the afternoon the house fans are shut down and the radiation used only. In fact, the house fans are operated only at such times as school is in session, the radiation taking care of building at all other times, in the sense that it does not permit building completely to cool down. Room temperatures drop as low in severe weather as 50°. Our records show that our split systems are operating at a cost per cubic contents of 20% less than our fan-blast systems.

"The fan-blast design described by Mr. McColl is a marked improvement over the conventional fan-blast design used in the past and no doubt will meet the deficiencies of the old design admirably, in taking care of the cold down-drafts on the outside wall, which was the chief factor, as pointed out by Mr. McColl, for introducing the split system.

"The automatic temperature control of rooms served by a fan-blast system is not so simple and constant as in the split system, in that the temperature of the hot air is manually varied to suit outside temperature conditions and often the temperature of the hot air is carried too high. In view of this, it would seem to the writer that conditions might obtain in a system, such as Mr. McColl describes, that with a too high diffusing temperature, on a fairly cold day, the thermostat would cause mixing damper to change from hot to tempered air, causing tempered air to flow in at window sill which would be too low in temperature to give the results desired, namely, break up the cold down-drafts.

"The writer has designed and installed both the conventional fan-blast and split systems and has under his supervision the operation of both. Aside from economy, the split system, with wall-type radiation on the outside wall, seems to maintain a more uniform temperature and makes for better comfort than the fan-blast system.

"The first cost of any installation is, of course, of prime importance and no doubt such a system as Mr. McColl describes can be installed in a school without basement rooms and with trunk ducts and lateral ducts to window sills, provided in the general contract, at as low a cost and possibly cheaper than a split system. This, however, would not be the case where individual ducts had to be carried back to fans in schools equipped with basements.

OPPOSED TO VENTILATING DUCTS DESIGNED AS PART OF BUILDING

"It has been the writer's experience that ventilating ducts, designed as a part of the building construction, regardless of exacting detailed drawings, miscarry. Especially is this true of small ducts. Rough surfaces, projections, offsets and square turns result, unless the heating engineer is on the job to supervise the form work, and it is obviously impossible for the engineer to do this.

"Many perversities are committed in the name of ventilation in the rather thinly-populated areas where the architect is not only an architect, but qualifies as a structural, electrical, and mechanical engineer as well, and the result of such perversities is the sentiment now gaining favor for window ventilation.

"It would be a happy day for all if a system such as Mr. McColl has so admirably designed could receive the publicity and be received with the same interest as the propaganda turned loose on window ventilation.

"The heating and ventilating engineer in most part serves the public, who are too busy with their own affairs to properly appraise his service. The average layman concedes every art and science involved in the assembly of a complex structure to the architect who accepts the concession and disposes of the engineering as he sees fit and to his best advantage. A wise architect wisely selects his engineer, realizing that success or failure of his building depends on the engineering.

"At such times as the public will insist on qualified engineers, such as Mr. McColl, a satisfied public will result and uncontrolled window ventilation methods will be relegated to the museums."

H. P. Dempsey, consulting engineer, of Buffalo:

"This paper of Mr. McColl's is very interesting, as it gives us a solution for the blast system. There are certain questions that come to mind such as:

"1. The cost of installation of this type of blast system, as compared with the split system.

"2. How are the corridors, wardrobes and toilet rooms ventilated; that is, is air supplied to corridors and vented through wardrobes and toilets? Are wardrobes located in classrooms or corridors and how ventilated?

"3. What is the usual temperature of hot air and of tempered air leaving fans in zero weather?

"The blast system, of course, compels the engineer to run the fans for heating as well as ventilation. It is true the split system has allowed the operating engineers to let the ventilating fans lie idle, but this may be overcome, to a certain extent, by placing only sufficient

direct radiation under the windows to care for the heat loss up to approximately 40° in zero weather.

"As Mr. McColl has pointed out, strong sentiment for open-window ventilation has grown, due to lack of or faulty operation of fans in split system, but I believe that we are responsible as a society for this condition. It has been known for some time that this condition exists and, as a body, we should have given concerted action to remove or modify the cause, and I still believe there is time for such action."

Master Plumbers Hold Forty-Fourth Annual Convention

NEARLY 3000 representatives of the plumbing industry, of whom 646 were registered delegates, attended the forty-fourth annual convention of the National Association of Master Plumbers in Louisville, June 22-24. As in former years, the exhibits proved an important feature of the convention, some 70 displays being on view in the Exhibit Hall, Kosair Temple.

Announcement was made of the selection of the four boys who will be the first to take the course in plumbing and heating which is to be conducted at the Carnegie Institute of Technology through the generosity of Theodore Ahrens, president of the Standard Sanitary Manufacturing Company. At the head of the list is R. L. Bryson, son of E. Dick Bryson, a heating and plumbing contractor of Chicago, who came from a family of plumbing and heating men, his grandfather having been one of the first members of the Chicago Plumbing Contractors Association. His father has been a member of the same association since 1893. The other boys are L. S. Neilsen, Brooklyn; W. F. Henderson, Gary, Ind.; and C. Reichenbach, Waterbury, Conn.

In addition to the professorship itself, made possible through the gift of $100,000 by Mr. Ahrens, a scholarship fund of sufficient size has been secured to insure its success. The fund includes an endowment of $20,000 made by J. M. Heatherton in memory of his father, the interest on which is intended to take care of two boys at the Institute. The Missouri State Association of Master Plumbers contributed $1000, to be known as the J. Sheehan Memorial Scholarship. The National Association gave $3000 per year to this fund or $6000 to date.

While the convention was in session, $500 was received from the Florida Ladies' Auxiliary and it was stated that this auxiliary has pledged a similar amount yearly to apply to the education of a Florida boy. Still later on in the convention, Frank J. Fee, chairman of the Scholarship Committee, announced that the Florida Association of Master Plumbers had turned over $1500 in its treasury to the Scholarship Committee. Other gifts were one of $1145 from the Women's Auxiliary and another of $2000 made by Raymond F. Brown of New York, in honor of his father, to be known as the Isaac J. Brown Scholarship Fund. With accrued interest of $247.06, the scholarship fund now amounts to $33,292.06. On Mr. Fee's recommendation, it was voted that the association pay over to the Scholarship Committee each year on February 1, the sum of $3000 for the use of the young men securing the scholarships.

Another recommendation of Mr. Fee, which was concurred in by the convention, was that the course be known as that of "Plumbing and Heating Engineering."

Among the resolutions referred to the Standardization Committee was one proposed by the New Jersey State Association in an effort to bring about the standardization of wrought-iron and steel pipe in lengths of 10 and 12 ft. respectively. This resolution was adopted with the further provision that each length of pipe shall be threaded at each end with a standard length of thread and with a standard size pipe coupling at one end of each length of pipe.

A proposal to establish a permanent office for the association aroused a lively discussion and was finally voted down. A recommendation of President Longley that the association should not publish a trade bulletin was not concurred in by the Resolutions Committee and the convention supported the committee in this opinion.

New officers of the association are: President, Albert J. Wilson, San Francisco; vice-president, Thomas F. Nolan, Albany, N. Y.; treasurer, A. C. Eynan, Canton, O.; secretary, Alexander Coleman, San Francisco.

It was voted to meet next year in Minneapolis.

Detroit Manufacturers to Have Permanent Exhibit and Sales Bureau

Permanent sales and exhibition rooms for Detroit manufacturers are being provided in Convention Hall Building in that city. The ground floor of the Wood Avenue frontage is being remodeled for that purpose. This exposition hall is one of the largest of its kind in the country. The plan is to divide the space into departments, each of which will contain articles of like nature. One of the departments will be devoted to materials entering into the actual construction of buildings of various kinds. This will include heating plants and oil burners. The project will be operated as the Manufacturers' Exhibit and Sales Bureau. The selling force will be under the supervision of W. R. Anderson.

Equipment of a Motor-Bus Plant

A motor-bus and motor-truck plant, described as one of the best-equipped structures of its kind, was opened recently by the White Company in San Francisco. Heat is supplied by a double row of 16-ft. radiators around the walls and down the center of the shop. These radiators are hung 13 ft. from the floor; those in the center being suspended from the roof beams by angle-irons. The radiators are supplied by branches of a 6-in. steam main which extends the length of the shop. The return pipe follows closely the line of the supply main.

Ventilation is obtained through large traffic doors, the windows and a series of brass louvres. These louvres, which are 2 x 3 ft., are located near the base of the pits which extend along the wall. These pits provide space for workbenches and serve to connect the lateral mechanic's-pits. With this provision, there can be no pockets of gas in the pits. A 30-ft. ceiling, with an elevated skylight equipped with ventilating windows, affords sufficient natural draft to produce a liberal air-change. Excess of motor gases in the atmosphere is avoided by the use of an exhaust pipe under the floor, from which flexible connections extend, at convenient intervals, to the stands. These connections are attached by quick-coupling devices to the exhausts of motors being tested or loosened up, and the exhaust gases drawn to the outside of the building.

View of Double Row of Radiators Suspended Down Center of Shop

View of Pits Kept Free of Gases by Ventilation through Louvres

The "Picture Ahead" for the Gas Industry

(From a bulletin issued by the American Gas Association)

THE fuel that promises to bring about revolutionary developments was first put to practical use in this country in 1806, when David Melville lighted his home at Newport, Rhode Island, with illuminating gas. Thereafter, for more than a century, gas dominated the lighting field, and, in addition, was heralded in later years as the ideal domestic cooking fuel.

AN INDUSTRY REBORN

Then came the invention of electricity. The gas lighting load fell off perceptibly, but gas already had gained a firm foothold as a domestic fuel and this advantage was used to extend its utilization to the field of large scale heating into which no fuel other than coal had been introduced.

To-day gas is an ideal heating fuel and therein lies one of its greatest opportunities for expansion.

The real nation-wide development of the gas industry dates from the time when the growing success of the electric light stimulated the development of the other and potentially far greater field for the use of gas as a domestic and industrial heating medium. Indeed, the statement is often made that the best thing that ever happened to the gas industry was the advent of the electric light. Sales of gas over the last two decades certainly afford ample substantiation for this statement, not to mention the almost innumerable new uses for gas fuel that have been developed in very recent years.

In any serious consideration of the prospects for growth of the manufactured gas industry, therefore, one must start with the fact that the gas business in the last twenty years has undergone a revolutionary change.

STEADY HOUSEHOLD DEMAND

Fortunate indeed is the industry which can claim for its own a market which affords a substantial and dependable source of income practically unaffected by fluctuations of business activity. This is true of the great domestic heating load enabling the gas companies to reach out into new and untried fields with the assurance that regardless of what may develop there still remains a stable domestic demand year in and year out.

Equally important, too, is the fact that the domestic load, notwithstanding its intensive cultivation, is admitted to-day to be open to almost unlimited development. There has been no talk of a saturation point so far as the gas business is concerned.

The Picture Ahead

HOMES artificially cooled in the summer and automatically heated in the winter; the substitution for ice of refrigerating machines utilizing gas heat; universal adoption of the temperature method of cooking food; elimination of raw coal as a domestic fuel due to the foregoing developments; and an unpolluted atmosphere free of smoke, ashes, soot and grime—these, in brief, constitute the "'picture ahead" presented by executives of the manufactured gas industry for the consideration of the American people.

Some idea of the position of the gas industry in the domestic field is obtained from figures made public by the American Gas Association, the national organization of manufactured gas companies. These show that approximately 52,000,000 persons in the United States are served by gas through the use of 9,800,000 stoves, 3,400,000 water heaters, 4,400,000 space heaters and hundreds of thousands of central house-heating installations. This is desirable and profitable business, increasing steadily as new customers at the rate of about 400,000 a year are being added to service mains.

It should be remembered that the domestic use of gas increases from year to year as the population increases, and to this should be added a steady increased per capita consumption as the cleanliness, economy and dependability of this essential fuel is better appreciated by the American people.

Sales of gas for all purposes in 1925 were 421 billion cubic feet, a new high record. This was an increase of 16 billion cubic feet over 1924, and a five-year increase of 100 billion cubic feet. In the last ten years sales of gas have more than doubled—a significant fact showing that gas service is now coming into its own, each year setting up a new high record of sales.

What of the future domestic load of gas companies? Will it be developed along existing lines—stoves, space heaters, water heaters, incinerators, etc., —or will the industry strike out into newer fields of utilization?

NEW SALES OPPORTUNITIES

The answer is that the industry will spare no efforts in building up its present domestic load, and, in addition, will take full advantage of the possibilities existing in house-heating, house-cooling and refrigeration. Only one is an innovation—house-cooling. The gas industry already has a substantial house-heating load and the development of the use of gas for household refrigeration has been going on for several years.

Let us consider house-heating. Since 1919 the increase in sales of gas-fired house-heating systems has averaged more than 2,000%. One manufacturer alone reports annual sales of 50,000 units, which, for this company, is an increase of 6,000% over 1919.

At the present time there are only two practical methods whereby automatic heating is possible, namely, by means of oil and by means of gas. As long as oil prices remain low, the oil furnace presents a certain economy of operation. On the other hand, gas rates for house-heating are generally stable and there are so many features which may render gas superior as a heating medium that the temporary difference in cost is more than equalized. Sales campaigns instituted by some of the leading gas companies of the country are making these facts known to hundreds of thousands of consumers.

In compiling information on the use of gas for house-heating, it was discovered that even in those cities where gas house-heating is still in its infancy, gas users turn to their ranges or room heaters to supply them with heat on cold mornings and evenings in the fall and winter when their boilers are not supplying them with warmth. This application is really house-heating by gas on a more or less primitive scale.

The latest figures show that installations of gas-fired house-heating units are being made at the rate of about 100,000 a year. One of the best selling arguments in favor of the gas-heated home is that the basement or cellar, formerly given over to coal, ashes, wood and a large coal furnace, can, with a gas-fired unit, be made into a playroom for the children, a billiard room, etc., thus adding a new room to the home.

REFRIGERATION AND COOLING

However, the introduction of house-heating on a huge scale without a compensating load would bring with it engineering problems of a serious nature. It is this situation which has caused the gas engineer to investigate other fields, notably refrigeration and artificial cooling of homes.

At the present time there are two types of gas-fired refrigerating machines on the market. These are the adsorption and absorption types. Both work equally well with gas fuel, the operation being noiseless as compared with other machines and the cost of maintenance and upkeep being less than other types operated by electricity. Gas-fired ice machines are being developed for sale by gas companies and there is a steadily growing demand for them.

Coincident with the merchandising of gas-fired machines comes the announcement that with the employment of better building methods, especially as applied towards proper insulation, the time is at hand when the American people will give serious thought to the matter of having their homes artificially cooled in summer.

One engineer who is a specialist on gas refrigeration says that homes in a few years will use gas as an ideal cooling agent in summer as they use it for a heating medium during the winter months. Here, he says, is a potential load which, when added to the load built up by gas-fired machines, will offset the heavy house-heating peaks and put the gas industry in a position where it can give the public all the gas it needs, and at the same time keep the temperature of homes at about 68° the year around, recommended by doctors and health officials.

NATIONAL SALES PROGRAM

To obtain a proper picture of the gas industry's cultivation of the domestic heating field, it is noteworthy that the commercial departments of gas companies are taking advantage of every sales opportunity to build up the domestic load.

At this moment, sales managers the country over are participating in a national program to increase domestic sales of gas. One of their objections is to interest the architect and builder in specifying adequate gas facilities in the home, and the first step in this nation-wide program was taken with the announcement of a prize contest to be conducted by the American Gas Association. Cash prizes of $2,500 are to be awarded to architects who submit winning plans for a six-room house that provides for all gas conveniences.

The establishment of home-service departments by gas companies is a comparatively recent development, but one which, in a few years, has enabled a large number of companies to make substantial increases in their sales of appliances and to further consolidate their position in the domestic market.

APPLIANCE TESTING LABORATORY

Perhaps the most important step ever taken by the gas industry in behalf of its customers was the establishment at Cleveland, Ohio, on July 31, 1925, of a laboratory for testing gas appliances. In this manner, the American Gas Association has met the obligation of the industry to the American people for the safest, most efficient and most economical utilization of its product. The laboratory is financed by a large number of gas companies and into it has been built the hopes and aims of the association to serve the public to the best of its ability.

In this laboratory will be tested for the information of manufacturers, gas companies, dealers and the general public, all manner of appliances in which gas is burned for domestic uses. The first task dealt with flexible gas tubing and this has been completed. The laboratory is now testing gas ranges and will follow these by water heaters and space heaters, both for warming individual rooms and for central heating of entire buildings.

Leaders of the industry believe, and are constantly preaching, a coming era of effective conservation of all natural resources and efficient and economical use of the public services. They foresee the time when the burning of raw fuel of any kind, including coal, will be forbidden. They believe that the necessity for conservation, together with the growing sense of the economic waste and the loss of health and efficiency as a result of smoke, will result in prohibition of the burning of coal by the individual. It is believed that perhaps 70% of the potential efficiency of coal is wasted in the average home and anywhere from 25% to 75% in industrial plants. The inevitable outcome, they say, will be the burning of gaseous fuel for all processes in which heat is required, with the possible exception of the steam railroads.

Following the same line of reasoning, one of the purposes of the American Gas Association in establishing its laboratory at Cleveland is to promote the economic uses of gas. Appliances of all sorts will be tested with various kinds of gas as to determine their efficiency under varied conditions and in different localities. Appliances which comply within specified limits with the standard specifications of the association will be given certificates to that effect. These certificates will be assets in the hands of manufacturers. With the support and co-operation of the gas companies and of dealers, it is anticipated that within a brief period there will be no sale for appliances other than those bearing this mark of approval, so that the public may be assured that the label of the American Gas Association guarantees efficiency in performance when rightly used.

After discussing the promising field for expansion through the use of gas for industrial heating purposes, the manual continues:

According to a recent estimate, American homes consume annually 65,000,000 tons of bituminous and 70,000,000 tons of anthracite coal. It is believed that one-fourth of this could be supplanted economically by gas, the total amount needed for this purpose being one thousand billion cubic feet, or nearly two and one-half times the present yearly sales of gas companies.

In addition, there is the gradual depletion of natural gas reserves, and the certainty that manufactured gas must provide the substitute where it has not already done so. Gas men who have given the subject careful study believe it reasonable to assume that within the next ten years manufactured gas will supersede as much as 20% of the present supply of natural gas in the ten States east of the Mississippi River that have this fuel. This means an additional eighty billion cubic feet of manufactured gas would be made to substitute for natural gas.

In the last analysis, nothing is burned until it has first been transformed, efficiently or inefficiently, into a gas. The position of the gas industry, therefore, is supreme in the heating field. The repetition of coal strikes, the outlawing of smoke, the demand of the modern housewife for the essential labor-saving services of utility companies, the advent of insulated homes and the growing necessity on the part of large fuel users for an absolutely dependable fuel service —these are a few of the developments which are bringing to the gas companies of America the largest volume of business in their history.

Death of F. Broadhurst Craig

F. Broadhurst Craig, consulting heating and ventilating engineer of London, England, died in that city recently of blood poisoning. Mr. Craig was a leader in his profession. He was born in Manchester in 1884, and received his training at Heaton Moor College and at the Manchester College of Technology. In 1904 he became draftsman and junior assistant engineer in the firm of Richardson & Company, heating and ventilating engineers, Darlington. Later, he was senior assistant engineer with W. F. Spencer Heating and Ventilating Specialties; engineer and manager of the Leeds branch of J. F. Phillips & Sons and, in 1915, general manager and chief engineer for that company. In 1920 Mr. Craig became consulting engineer and London manager for Dilworth & Carr, Limited, heating and ventilating engineers and manufacturers of heating apparatus.

Mr. Craig was the author of "A Treatise on Central Heating," and a lecturer at the Architects' Association, London. He was a member of the

American Society of Heating and Ventilating Engineers and of the British Institution of Heating and Ventilating Engineers.

URI T. HUNGERFORD, chairman of the board of directors of the U. T. Hungerford Brass & Copper Co., New York, died at his home in that city, June 16. He was 85 years old. Mr. Hungerford was one of the oldest brass and copper men in the country. His father was in the business before him and established one of the pioneer brass mills in Torrington, Conn., in 1834. Mr. Hungerford early became associated with the brass and copper rolling mill of Wallace & Sons, in Ansonia, Conn. He was the company's manager in New York until 1895, when he established the present U. T. Hungerford Brass & Copper Co.

A completely-equipped hospital in Torrington, in memory of his mother, was presented by Mr. Hungerford in 1917. It is known as the Charlotte Hungerford Hospital. Mr. Hungerford was a member of the New York Merchants' Association, Machinery Club, Sleepy Hollow Country Club and a charter member of the New York Hardware Club.

ALEX LAUGHLIN, JR., president of the Central Tube Co., Pittsburgh, died June 12, while undergoing a minor operation at West End Hospital, Pittsburgh. He was 38 years of age. Mr. Laughlin was a graduate of Yale University and served through the World War as a major in the 354th Infantry, 83rd Division. He was a director of the Verona Tool Works and of the Monongahela National Bank. He became president of the Central Tube Company in 1919, being promoted from the vice-presidency to succeed his father.

JOHN H. COONEY, a well-known heating contractor of Harrington, N. J., died of penumonia on June 12 at St. James Hospital, Newark. He was 56 years old. Mr. Cooney had a host of friends in the industry, and had become one of the best-known contractors in the State. He was a member of the Heating & Piping Contractors National Association, an Elk, a Knight of Columbus and a Kiwanian. He was a member of the Eastern Trade Golf Association.

Death of Frank A. Dwyer

Frank A. Dwyer, pioneer heating and ventilating engineer and one of the oldest members of the American Society of Heating and Ventilating Engineers, died at his home in Amsterdam, N. Y., June 6, after an illness which lasted about one week. He was sixty years of age. Mr. Dwyer was born in Amsterdam, N. Y., and received his education at the district school, at St. Mary's Institute and, later, at Niagara University.

He served his apprenticeship in his father's firm, John F. Dwyer & Son, and later took a position with the Model Heating Company, New York and Philadelphia. From there he went to the H. B. Smith Company of Westfield, Mass., as salesman and heating engineer.

During the World War, Mr. Dwyer was stationed in Washington, D. C., as consulting engineer in the construction division of the United States Army, and received a citation for his work and service. At the close of the war he resumed his work as consulting and heating engineer with headquarters in Amsterdam, and, up to the time of his illness, devoted his time exclusively to this work.

New Chimney Ordinance for Columbus

A new chimney ordinance No. 37044, amending Section 44 of Ordinance No. 36044, known as the Columbus Building Code, has been passed by the council of the City of Columbus, Ohio. Irrespective of the fuel used except gas, the new ordinance requires a minimum area inside of the chimney flue lining of 75 sq. in. for warm-air furnaces and low-pressure steam and water heating boilers. When gas is the fuel, in a heating furnace boiler or automatic water heater, the flues must be of the same size and construction as are required for stoves and ranges using other fuel.

It is provided that all flues to which heating furnaces or boilers are to be connected shall be subjected to a smoke test whenever, in the opinion of the inspector of buildings, such a test is necessary, but the test is not to be made until the mortar has thoroughly hardened.

Following are the minimum chimney flue sizes and heights required for furnaces and low-pressure steam and water boilers.

The ordinance became effective May 24, 1926.

How the Building Dollar is Spent

An item in *The Architect and Engineer* for June, 1926, tells of an analysis made by the Copper and Brass Research Association of the cost of nine houses of frame construction varying in price from $9,000 to $23,000 and averaging $15,000. The analysis shows the following relationship between the various elements:

	Per cent.	Average Costs
Excav. and Grading	1.8	$ 270
Masonry	9.4	1,410
Stucco, Plaster & Tile	10.6	1,590
Carpentry	27.2	4,080
Roofing	5.4	810
Flashing, Dwnspts, etc	0.7	105
Plumbing	9.3	1,395
Heating	7.0	1,050
Electric Wiring, etc	2.7	405
Hardware	2.0	300
Painting and Glazing	4.5	675
Screens	0.9	135
Total for Construction	81.5	12,225
Landscaping	3.0	450
Builder's Profit	9.4	1,410
Architect's Fee	4.5	675
Financing	1.6	240
	100.00	$15,000

Minimum Chimney Flue Sizes and Heights Required for Furnaces and Low-Pressure Steam and Water Boilers

Area dimensions given are inside measurements of the masonry walls of the chimney

Warm air furnace capacity in leader pipe—sq. in.	BOILER CAPACITY		NUMBER OF HEATERS ATTACHED TO FLUE							
			1		2		3		4	
	Hot water rating—sq. ft.	Steam (direct) rating—sq. ft.	Dimensions Inches	Height Feet	Heaters cross-connected forming a battery and attached to one flue opening					
					Dimensions Inches	Height Feet	Dimensions Inches	Height Feet	Dimensions Inches	Height Feet
To 450	To 700	To 450	8x12	35						
800	900	600	8x12	35						
1000	1100	700	8x12	40						
	1500	1000	12x12	35						
	2500	1500	12x12	40	12x16	45	16x20	50	20x20	55
	4000	2500	12x16	40	16x20	50	20x24	55	24x24	60
	5800	3600	16x16	45	20x24	55	24x28	60	28x28	65
	7300	4500	16x20	50	24x24	60	28x32	65	30x30	70
	8700	5400	20x20	55	24x28	65	30x30	70	30x36	80
	10000	6400	20x24	60	28x28	70	30x32	80	30x36	90
	12000	7400	24x24	65	30x30	75	32x32	85	36x36	90
	14000	8400	24x28	65	32x32	75	30x36	85	36x42	100
	15000	9400	28x28	70	30x36	80	36x36	90	42x42	100
	17000	10400	28x32	70	30x36	80	36x42	90	42x48	100
	19000	11400	30x30	70	36x36	80	42x42	90	48x48	100

Where round tile flue lining is used in place of rectangular, the nearest corresponding area shall be taken.

Present Practice in Vapor Heating

HOW rapidly vapor heating has advanced is shown in the revision now found necessary in THE HEATING AND VENTILATING MAGAZINE'S Standard Data Sheets on this subject (No. 132 to 132-ZZ) which were compiled less than three years ago, and some even more recently. To be sure, the changes are not so much in the basic designs as in the refinements which have been adopted to simplify installation and operation.

Taking the Data Sheets in the order in which they were first published, the first notable refinement is in the Webster Type R system (Data Sheets 132-I revised to 132-J2 revised, inclusive). The general design of this system remains the same, the change being in the damper regulator which replaces the type previously used. The Webster Type R modulation system, as now installed, follows the outline here shown:

Webster Type R Modulation System

STEAM at very low pressure is circulated through the system, the air entrained in the radiators and piping is removed and the water of condensation is automatically returned to the boiler.

The layout of a typical system is illustrated in Fig. 1. The highest point of the steam mains is at the boiler. They branch from this point and grade downward in the direction of the arrows and are dripped at the ends into a wet return through which the condensation flows back to the boiler.

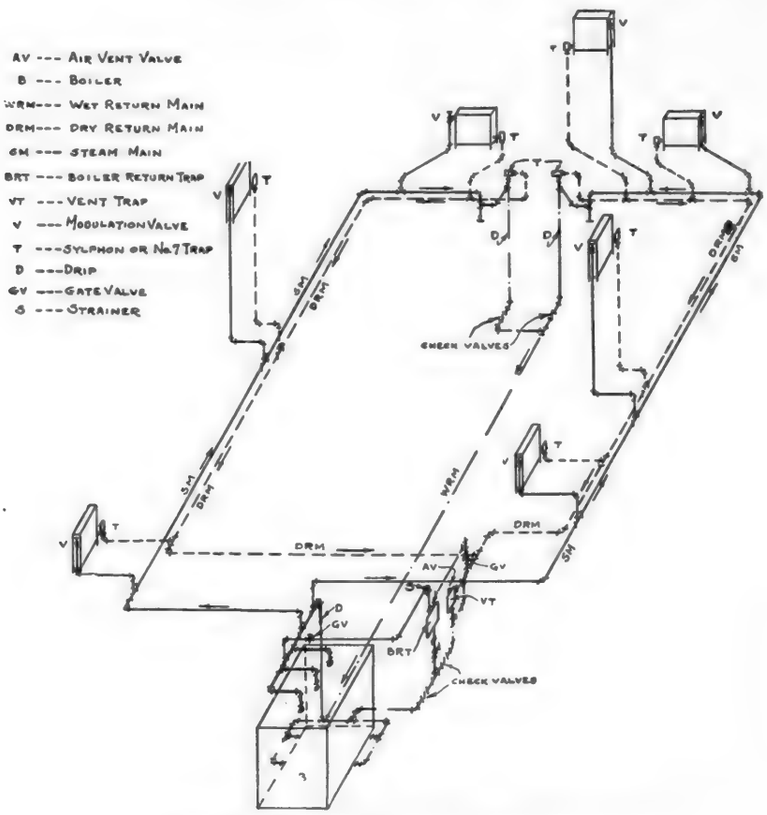

AV --- AIR VENT VALVE
B --- BOILER
WRM --- WET RETURN MAIN
DRM --- DRY RETURN MAIN
SM --- STEAM MAIN
BRT --- BOILER RETURN TRAP
VT --- VENT TRAP
V --- MODULATION VALVE
T --- SYLPHON OR No. 7 TRAP
D --- DRIP
GV --- GATE VALVE
S --- STRAINER
CHECK VALVES
CHECK VALVES

Fig. 1. Webster Type R Modulation System

A modulation or graduated-control valve is attached to the inlet of each radiator and a thermostatic trap to the outlet. The water and air pass out of the radiators through the thermostatic traps and flow back by gravity in the overhead dry-return piping to a vent trap and boiler return trap and thence to the boiler. The air is removed from the ends of the steam mains through the thermostatic traps which discharge into the dry returns.

The piping system is designed to secure circulation of steam at a very small drop in pressure, the amount depending upon the size and character of the installation. For residences the pressure drop is usually not over 2 to 4 oz. The boiler return trap is designed to automatically deliver water to the boiler regardless of the steam pressure therein provided it is less than 15 lbs. per square inch.

Fig. 2 is a cross-section of the boiler return trap. The top of the trap body contains two single, spherical-seated valves, one to control the admission of steam to the trap, the other to permit steam and air to exhaust. Both valves are operated by the movement of a float which at its lowest position holds the exhaust valve open and the steam valve closed. At its highest point the position of the valves is reversed. The float is counterweighted in such a manner that it moves only when the water reaches the high or low level position. There is no dead center position, each valve is either wide open or completely closed. A cross section of the vent trap and a view of the vent valve are shown in Fig. 3.

Fig. 2. Webster 023 Size Boiler Return Trap

The piping around the vent trap and boiler return trap is arranged as indicated in Fig. 4. Condensation flows from the horizontal return around the vent trap into the main return piping. The air passes into the vent trap through the opening R. The vent trap permits the air to pass out of the system but prevents any water following. Attached to the air outlet of the vent trap is a vent valve which allows the air to escape but closes to prevent its return, thus holding any vacuum formed in the system.

The condensation enters and leaves the boiler return trap through the opening O in the bottom. Steam is led from the boiler to the steam inlet of the trap and the exhaust outlet is connected into the dry return.

During the time that the boiler pressure is very low, the static head required to overcome this pressure is small and the water will return directly to the boiler without the assistance of the boiler return trap. With the float of the trap in its lowest position, the steam valve is closed, the exhaust valve

INFILTRATION

Stationary Wood Sash	25	French Doors	100
Double Hung Wood Sash	50	Outside Doors	200
Double Hung Steel Sash	100	Outside Doors with Storm Doors	100
Casement Windows	100	Outside Doors with Inner Vestibule Doors	100
Fenestra	100		

Metal Weather Strip Deducts 50%

HEATING AND PIPING CONTRACTORS N

STANDARD RADIATION ESTIMAT

SHOWING RADIATION REQUIRED FOR QUAN

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3 Col 38" St'm Rad	GLASS		INFILTRATION				OUTSIDE WALLS																	
	Win. or Door	Sky Light	Rate per Lin. Ft.				Plain Brick			Brick and Pl.			Brick Fur. L. P.			Br. 4" Tile Pl.			Plain Conc.			Conc. Fur L.		
			25	50	100	200	8"	12"	16"	8"	12"	16"	8"	12"	16"	4"	8"	12"	8"	12"	16"	8"	12"	16
	1.1	1.3	0.45	0.9	1.8	3.6	.42	.32	.26	.38	.29	.25	.27	.23	.21	.30	.26	.22	.60	.48	.41	50	.40	.3
225	77.0	91.0	31.5	63.0	12.6	25.2	29.4	22.4	18.2	26.6	20.3	17.5	18.9	16.1	14.7	21.0	18.2	15.4	42.0	33.6	28.7	35.0	28.0	23
1	2.92	2.47	7.14	3.57	1.79	.89	7.7	10.0	12.4	8.5	11.1	12.9	11.9	14.0	15.3	10.7	12.4	14.6	5.4	6.7	7.8	6.4	8.0	9
2	5.84	4.94	14.3	7.14	3.58	1.78	15.4	20.0	24.8	17.0	22.2	25.8	23.8	28.0	30.6	21.4	24.8	29.2	10.8	13.4	15.6	12 8	16.0	19
3	8.76	7.41	21.4	10.7	5.37	2.67	23.1	30.0	37.2	25.5	33.3	38.7	35.7	42.0	45.9	32.1	37.2	43.8	16.2	20.1	23.4	19.2	24.0	28
4	11.7	9.88	28.6	14.2	7.16	3.56	30.8	40.0	49.6	34.0	44.4	51.6	47.6	56.0	61.2	42.8	49 6	58.4	21.6	26.8	31.2	25.6	32.0	38
5	14.6	12.4	35.7	17.9	8.95	4.45	38.5	50.0	62.0	42.5	55.5	64.5	59.5	70.0	76.5	53 5	62.0	73.0	27.0	33.5	39.0	32.0	40.0	47
6	17.5	14.8	42.8	21.4	10.7	5.34	46.2	60.0	74.4	51.0	66.6	77.4	71.4	84.0	91.8	64.2	74 4	87.6	32.4	40.2	46.8	38.4	48.0	57
7	20.4	17.3	49.9	25.0	12.5	6.23	53.9	70.0	86.8	59.5	77.7	90.3	83.3	98.0	107	74.9	86.8	102	37.8	46.9	54 6	44.8	56.0	66
8	23.4	19.8	57.1	28.6	14.3	7.12	61.6	80.0	99.2	68.0	88.8	103	95.2	112	122	85.6	99.2	117	43.2	53.6	62.4	51.2	64 0	76
9	26.3	22.2	64.3	32.1	16.1	8.01	69.3	90.0	112	76.5	99.9	116	107	126	138	96.3	112	131	48.6	60 3	70.2	57.6	72.0	85
10	29.2	24.7	71.4	35.7	17.9	8.90	77.0	100	124	85.0	111	129	119	140	153	107	124	146	54.0	67.0	78.0	64.0	80.0	95
11	32.1	27.2	78.5	39.3	19.7	9.79	84.7	110	136	93.5	122	142	131	154	168	118	136	161	59.4	73.7	85.8	70.4	88.0	1
12	35.0	29.6	85.7	42.8	21.5	10.7	92.4	120	149	102	133	155	143	168	184	128	149	175	64.8	80.4	93.6	76.8	96.0	1
13	38.0	32.1	92.8	46.4	23.2	11.6	100	130	161	111	144	168	155	182	199	139	161	190	70.2	87.1	101	83.2	104	1
14	40.9	34.6	100	50.0	25.1	12 5	108	140	174	119	155	181	167	196	214	150	174	204	75.6	93.8	109	89.6	112	1
15	43.8	37.1	107	53.6	26.9	13.4	116	150	186	128	167	194	179	210	230	161	186	219	81.0	101	117	96.0	120	1
16	46.7	39.5	114	57.1	28.6	14.2	123	160	198	136	178	206	190	224	245	171	198	234	86.4	107	125	102	128	1
17	49.6	42.0	121	60.7	30.4	15.1	131	170	211	145	189	219	202	238	260	182	211	248	91.8	114	133	109	136	1
18	52.6	44.5	129	64.3	32.2	16.0	139	180	229	153	200	232	214	252	275	193	223	263	97.2	121	140	115	144	1
19	55.5	46.9	136	67.9	34.0	16.9	146	190	236	162	211	245	226	266	291	203	236	277	103	127	148	122	152	1
20	58.4	49.4	143	71.4	35.8	17.8	154	200	248	170	222	258	238	280	306	214	248	292	108	134	156	128	160	1
21	61 3	51 9	150	75.0	37.6	18.7	162	210	260	179	233	271	250	294	321	225	260	307	113	141	164	134	168	2
22	64.2	54.3	157	78.5	39.4	19.6	169	220	273	187	244	284	262	308	337	235	273	321	119	147	172	141	176	2
23	67.2	56.8	164	82.1	41.2	20.5	177	230	285	196	255	297	274	322	352	246	285	336	124	154	179	147	184	2
24	70.8	59.3	171	85.7	43.0	21.4	185	240	298	204	266	310	286	336	367	257	298	350	130	161	187	154	192	2
25	73.0	61.8	179	89.3	44.8	22.3	193	250	310	213	278	323	298	350	383	268	310	365	135	168	195	160	200	2

For Methods of Using Table See Back of Sheet.

INFILTRATION

Stationary Wood Sash	25	French Doors	100
Double Hung Wood Sash	50	Outside Doors	200
Double Hung Steel Sash	100	Outside Doors with Storm Doors	100
Casement Windows	100	Outside Doors with Inner Vestibule Doors	100
Fenestra	100		

Metal Weather Strip Deducts 50%

HEATING AND PIPING CONTRACTORS N

STANDARD RADIATION ESTIMAT

SHOWING RADIATION REQUIRED FOR QUAN

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3 Col 38" St'm Rad	GLASS		INFILTRATION				OUTSIDE WALLS																	
	Win. or Door	Sky Light	Rate per Lin. Ft.				Plain Brick			Brick and Pl.			Brick Fur. L. P.			Br. 4" Tile Pl.			Plain Conc.			Conc. Fur L. P.		
			25	50	100	200	8"	12"	16"	8"	12"	16"	8"	12"	16"	4"	8"	12"	8"	12"	16"	8"	12"	16"
	1 1	1 3	0 45	0 9	1.8	3.6	.42	32	26	.38	.29	.25	.27	.23	.21	.30	.26	.22	.60	.48	.41	50	.40	.34
225	27 5	32 5	11.25	22.5	45.0	90.0	10.5	8.00	6.50	9.50	7.25	6.25	6.75	5.75	5.25	7.50	6.50	5.50	15.0	12.0	10.25	12.5	10.0	8.5
1	8.18	6.92	20 0	10.0	5 0	2.5	21.4	28 1	34.6	23.7	31.0	36.0	33.3	39.1	42.9	30.0	34.6	40.9	15.0	18.8	22.0	18.0	22.5	26.
2	16 4	13.8	40.0	20.0	10 0	5.0	42.8	56.2	69.2	47.4	62.0	72.0	66.6	78.2	85.8	60.0	69.2	81.8	30.0	37.6	44.0	36.0	45.0	53.
3	24 5	20.8	60.0	30 0	15.0	7.5	64.6	84.3	104	71.1	93.0	108	99.9	117	129	90.0	104	.123	45.0	56.4	66.0	54.0	67.5	79.
4	32.7	27 7	80.0	40 0	20.0	10 0	85.6	112	138	94.8	124	144	133	156	172	120	138	164	60.0	75.2	88.0	72.0	90.0	10
5	40 9	34.6	100	50.0	25.0	12.5	107	141	173	119	155	180	167	196	215	150	173	205	75.0	94.0	110	90.0	113	13
6	49 1	41.5	120	60.0	30.0	15.0	128	169	208	142	186	216	200	235	257	180	208	245	90.0	113	132	108	135	15
7	57 3	48.4	140	70.0	35 0	17.5	150	197	242	166	217	252	233	274	300	210	242	286	105	132	154	126	158	18
8	65.4	55.4	160	80 0	40 0	20.0	171	225	277	190	248	288	266	313	343	240	277	327	120	150	176	144	180	21
9	73 6	62 3	180	90.0	45.0	22.5	193	253	311	213	279	324	300	352	386	270	311	368	135	169	198	162	203	23
10	81.8	69 2	200	100	50 0	25.0	214	281	346	237	310	360	333	391	429	300	346	409	150	188	220	180	225	26
11	90.0	76.1	220	110	55 0	27.5	235	309	381	261	341	396	366	430	472	330	381	450	165	207	242	198	248	29
12	98.2	83 0	240	120	60 0	30.0	257	337	415	284	372	432	400	469	515	360	415	491	180	226	264	216	270	31
13	106	90 0	260	130	65.0	32 5	278	365	450	308	403	468	433	508	558	390	450	532	195	244	286	234	293	34
14	114	96 9	280	140	70 0	35.0	300	393	484	332	434	504	466	547	601	420	484	573	210	263	308	252	315	37
15	123	104	300	150	75 0	37 5	321	422	519	356	465	540	500	587	644	450	519	614	225	282	330	270	338	39
16	131	111	320	160	80 0	40 0	342	450	554	379	496	576	533	626	686	480	554	654	240	301	352	288	360	42
17	139	118	340	170	85 0	42 5	364	478	588	403	527	612	566	665	729	510	588	695	255	320	374	306	383	45
18	147	125	360	180	90 0	45 0	385	506	623	427	558	648	599	704	772	540	623	736	270	338	396	324	405	47
19	155	131	380	190	95 0	47 5	407	534	657	450	589	684	633	743	815	570	657	777	285	357	418	342	428	50
20	164	138	400	200	100	50 0	428	562	692	474	620	720	666	782	858	600	692	818	300	376	440	360	450	53
21	172	145	420	210	105	52 5	449	590	727	498	651	756	699	821	901	630	727	859	315	395	462	378	473	55
22	180	152	440	220	110	55 0	471	618	761	521	682	792	733	860	944	660	761	900	330	414	484	396	495	58
23	188	159	460	230	115	57 5	492	646	796	545	713	828	766	899	987	690	796	941	345	432	506	414	518	61
24	196	166	480	240	120	60 0	514	674	830	569	744	864	799	938	1030	720	830	982	360	451	528	432	540	63
25	204	173	500	250	125	62 5	535	703	865	593	775	900	833	978	1073	750	865	1023	375	470	550	450	563	66

TORS NATIONAL ASSOCIATION
ESTIMATING TABLE
FOR QUANTITIES INDICATED

ion than that Shown See Heating and Piping Contractors National Association Engineering Standards.

DETROIT

TEMPERATURE FACTORS		EXPOSURE FACTORS			
Room Temperature	70°=T_1	N	1.10	S	1.10
Base Temperature	0°=T_2	NE	1.00	SW	1.10
Base Temp. 0° Equivalent to		E	1.00	W	1.10
Guarantee Temp. —15° Outside		SE	1.00	NW	1.10

Conc. Fur L. P. 8"	12"	16"	Frame Std.	Frame No Sh'g	Frame No L. P.	ROOF T&G on 1" Bd.	T&G on 4" Conc.	Sh'gle on Sh'g	Sh'gle Sh'g L. P.	Base Floor Conc. on Earth	Wood on Sleep	Interm'e Floor 4" Conc.	4" Conc. 3" Fill 1" Fin.	Double Wood	Ceiling Lath and Plas.	L & P Wo. Fl. Over	Partition Stud L & P 1 Side	Stud L & P 2 Side		Type Kind Thick.
50	.40	.34	.24	31	35	30	60	40	30	31	13	.20	.15	20	.49	.28	.60	.33		K
35.0	28.0	23.8	16.8	21.7	24.5	21.0	42.0	28.0	21.0	10.9	4 55	7.0	5.25	7.0	17.2	9.8	21.0	11.6		K(Ti-To)
6.4	8.0	9.5	13.4	10.4	9.2	10.7	5.4	8.0	10.7	20.7	49 5	32.2	42.9	32 2	13.1	23 0	10.7	19.4		1
12 8	16.0	19.0	26.8	20.8	18.4	21.4	10.8	16.0	21.4	41.4	99 0	64.4	85 8	64.4	26.2	46.0	21 4	38.8		2
19.2	24.0	28.5	40.2	31.2	27.6	32:1	16.2	24.0	32.1	62.1	149	96 6	129	96 6	39.3	69.0	32.1	58.2		3
25.6	32.0	38.0	53.6	41.6	36.8	42.8	21.6	32.0	42.8	82.8	198	129	172	129	52.4	92.0	42.8	77.6		4
32.0	40.0	47.5	67.0	52.0	46.0	53.5	27.0	40.0	53.5	104	248	161	215	161	65.5	115	53.5	97.0		5
38.4	48.0	57.0	80.4	62.4	55.2	64.2	32.4	48 0	64.2	124	297	193	257	193	78 6	138	64.2	116		6
44.8	56.0	66.5	93.8	72.8	64.4	74.9	37.8	56.0	74 9	145	347	225	300	225	91 7	161	74.9	136		7
51.2	64 0	76 0	107	83.2	73.6	85.6	43.2	64.0	85.6	166	396	258	343	258	105	184	85.6	155		8
57.6	72.0	85.5	121	93.6	82.8	96.3	48.6	72.0	96.3	186	446	290	386	290	118	207	96.3	175		9
64.0	80.0	95.0	134	104	92.0	107	54 0	80.0	107	207	495	322	429	322	131	230	107	194		10
70.4	88.0	105	147	114	101	118	59.4	88.0	118	228	545	354	472	354	144	253	118	213		11
76.8	96.0	114	161	125	110	128	64.8	96.0	128	248	594	386	515	386	157	276	128	233		12
83.2	104	124	174	135	120	139	70.2	104	139	269	644	419	558	419	170	299	139	252		13
89.6	112	133	188	146	129	150	75.6	112	150	290	693	451	601	451	183	322	150	272		14
96.0	120	143	201	156	138	161	81.0	120	161	311	743	483	644	483	196	345	161	291		15
102	128	152	214	166	147	171	86.4	128	171	331	792	515	686	515	209	368	171	310		16
109	136	162	228	177	156	182	91.8	136	182	352	842	547	729	547	223	391	182	330		17
115	144	171	241	187	166	193	97 2	144	193	373	891	580	772	580	236	414	193	349		18
122	152	181	255	198	175	203	103	152	203	393	941	612	815	612	249	437	203	369		19
128	160	190	268	208	184	214	108	160	214	414	990	644	858	644	262	460	214	388		20
134	168	200	281	218	193	225	113	168	225	435	1040	676	901	676	275	483	225	407		21
141	176	209	295	229	202	235	119	176	235	455	1089	708	944	708	288	506	235	427		22
147	184	219	308	239	212	246	124	184	246	476	1139	741	987	741	301	529	246	446		23
154	192	228	322	250	221	257	130	192	257	497	1188	773	1030	773	314	552	257	466		24
160	200	238	355	260	230	268	135	200	268	518	1238	805	1073	805	327	575	268	485		25

← These Items Figured on Basis of K $\left(\frac{T_1-T_2}{2}\right)$ →

ORS NATIONAL ASSOCIATION
ESTIMATING TABLE
OR QUANTITIES INDICATED

on than that Shown SeeHeating and Piping Contractors National Association Engineering Standards.

SAN ANTONIO, TEXAS

TEMPERATURE FACTORS		EXPOSURE FACTORS			
Room Temperature	70°=T_1	N	1.70	S	1.00
Base Temperature	+45°=T_2	NE	1.70	SW	1.00
Base Temp. +45° Equivalent to		E	1.40	W	1.70
Guarantee Temp. of +30° Outside		SE	1.00	NW	1.70

nc. Fur L. P.	12"	16"	Frame Std.	Frame No Sh'g	Frame No L. P.	ROOF T&G on 1" Bd.	T&G on 4" Conc.	Sh'gle on Sh'g	Sh'gle Sh'g L. P.	Base Floor Conc. on Earth	Wood on Sleep.	Interm'e Floor 4" Conc.	4" Conc. 3" Fill 1" Fin.	Double Wood	Ceiling Lath and Plas.	L & P Wo. Fl. Over	Partition Stud L & P 1 Side	Stud L & P 2 Side		Type Kind Thick.
0	.40	.34	.24	.31	.35	30	.60	40	.30	31	13	20	.15	20	49	.28	60	.33		K
5	10.0	8.50	6.00	7.75	8.75	7.50	15.0	10.0	7.50	3.875	1.625	2 50	1.875	2.50	6.125	3.50	7.50	4.125		K(Ti-To)
0	22.5	26.5	37.5	29.0	25.7	30 0	15.0	22 5	30 0	58.1	138 5	90 0	120	90.0	36.7	64.3	30.0	54.6		1
0	45.0	53.0	75.0	58 0	51.4	60.0	30.0	45 0	60 0	116	277	180	240	180	73.4	129	60.0	109		2
.0	67.5	79.5	113	87.0	77.1	90.0	45.0	67.5	90.0	174	416	270	360	270	110	193	90.0	164		3
.0	90.0	106	150	116	103	120	60.0	90 0	120	232	554	360	480	360	147	257	120	218		4
.0	113	133	188	145	129	150	75.0	113	150	291	693	450	600	450	184	322	150	273		5
08	135	159	225	174	154	180	90 0	135	180	349	831	540	720	540	220	386	180	328		6
26	158	186	263	203	188	210	105	158	210	407	970	630	840	630	257	450	210	382		7
4	180	212	300	232	206	240	120	180	240	465	1108	720	960	720	294	514	240	437		8
2	203	239	338	261	231	270	135	203	270	523	1247	810	1080	810	330	579	270	491		9
0	225	265	375	290	257	300	150	225	300	581	1385	900	1200	900	367	643	300	546		10
8	248	292	413	319	283	330	165	248	330	639	1524	990	1320	990	404	707	330	601		11
6	270	318	450	348	308	360	180	270	360	697	1662	1080	1440	1080	440	772	360	655		12
4	293	345	488	377	334	390	195	293	390	755	1801	1170	1560	1170	477	836	390	710		13
2	315	371	525	406	360	420	210	315	420	813	1939	1260	1680	1260	514	900	420	764		14
0	338	398	563	435	386	450	225	338	450	872	2078	1350	1800	1350	551	965	450	819		15
8	360	424	600	464	411	480	240	360	480	930	2216	1440	1920	1440	587	1029	480	874		16
6	383	451	638	493	437	510	255	383	510	988	2355	1530	2040	1530	624	1093	510	928		17
4	405	477	675	522	463	540	270	405	540	1046	2493	1620	2160	1620	661	1157	540	983		18
2	428	504	713	551	488	570	295	428	570	1104	2632	1710	2280	1710	697	1222	570	1037		19
0	450	530	750	580	514	600	300	450	600	1162	2770	1800	2400	1800	734	1286	600	1092		20
8	473	557	788	609	540	630	315	473	630	1220	2908	1890	2520	1890	771	1350	630	1147		21
6	495	583	825	638	565	660	330	495	660	1278	3047	1980	2640	1980	807	1415	660	1201		22
4	518	610	863	667	591	690	345	518	690	1336	3186	2070	2760	2070	844	1479	690	1256		23
2	540	636	900	696	617	720	360	540	720	1394	3324	2160	2880	2160	881	1543	720	1310		24
0	563	663	938	725	643	750	375	563	750	1453	3463	2250	3000	2250	918	1608	750	1365		25

is open, and there is a direct connection between the dry return and the interior of the boiler return trap. As soon as the pressure rises, the water rises in the return pipe and enters the trap. When it reaches the high level point, the float lifts, closing the steam valve and opening the exhaust valve. Steam, at boiler pressure, is admitted to the trap above the surface of the water. The pressure rapidly equalizes with that in the boiler and, owing to the greater height of the water in the trap, it flows into the boiler. When the level of water falls to the low point, the float drops, closing the steam valve, opening the exhaust valve and allowing the steam to escape into the return pipe where it is condensed. As soon as equalization takes place between the interior of the boiler return trap and the dry return, condensation commences to enter the trap again and the cycle repeats itself. While the boiler return trap is discharging to the boiler, the condensation continues to flow back from the system. Instead of accumulating in the dry return main it collects in the vent trap, the latter having a storage capacity equal to one discharge of the boiler return trap.

Vent Valve

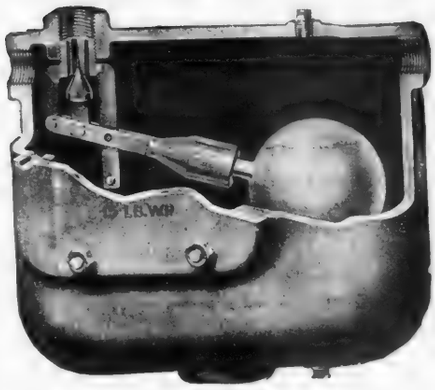


Fig. 3. Webster 023 Vent Trap

The two check valves in the piping serve respectively to prevent the water from flowing back into the return while the trap is discharging into the boiler and from leaving the boiler while the trap is in the act of filling.

The table gives the ratings of the various sizes of boiler return traps and vent traps, the sizes of the tappings, the number of vent valves required and the correct relation between the vent trap, the boiler return trap and the boiler water-line. The vent trap is so located with respect to the boiler return trap that there is adequate filling head at the time the water has reached the high level in the boiler return trap. This relationship is secured when the distance H between the bottom of the boiler return trap and the center line of the dry return main is made the same as that given in the table. The distance between the bottom of the boiler return trap and the boiler water-line must be sufficient to furnish the head required to lift the check valve A and overcome the friction of the piping so as to discharge the water from the trap to the boiler within the allotted time. This distance should not be less than 4 in. and as much more as the conditions permit.

After sufficient pressure has been raised in the boiler to completely fill the radiators with steam and expel the air, the system may be operated for a period under vapor or even partial vacuum. Any vacuum formed in the radiators by the condensation of the steam, and communicated to the return, is held by the vent valve. Eventually this vacuum of condensation finds its way through the supply piping to the boiler. When this condition is reached, the heated water within the boiler continues to give off vapor even when its temperature is below 212°, the boiling point at atmospheric pressure.

While the quantity of vapor thus produced may not completely heat every radiator or proportionately heat each radiator, at the same time it may be sufficient for comfort in mild weather or during the night.

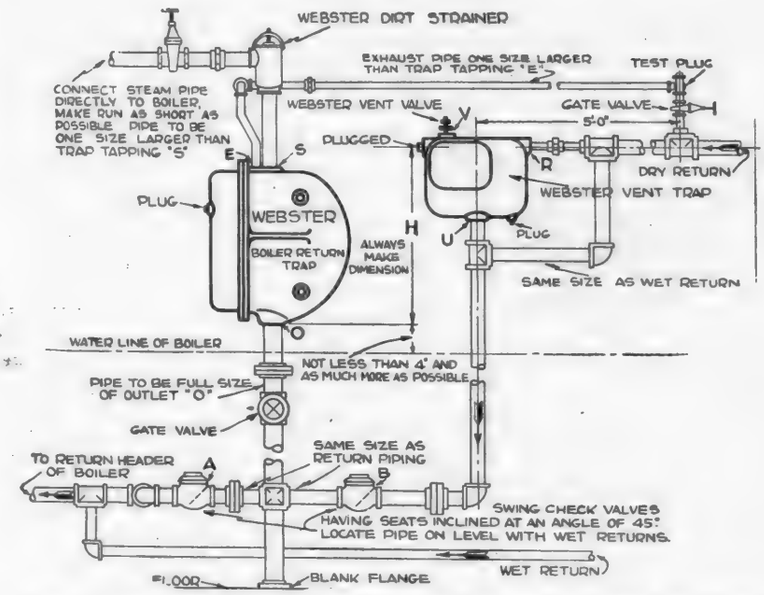

WEBSTER DIRT STRAINER
EXHAUST PIPE ONE SIZE LARGER THAN TRAP TAPPING "E"
TEST PLUG
CONNECT STEAM PIPE DIRECTLY TO BOILER, MAKE RUN AS SHORT AS POSSIBLE. PIPE TO BE ONE SIZE LARGER THAN TRAP TAPPING "S"
WEBSTER VENT VALVE
GATE VALVE
5'-0"
PLUGGED
DRY RETURN
WEBSTER VENT TRAP
PLUG
WEBSTER
BOILER RETURN TRAP
ALWAYS MAKE DIMENSION
PLUG
SAME SIZE AS WET RETURN
WATER LINE OF BOILER
NOT LESS THAN 4" AND AS MUCH MORE AS POSSIBLE
PIPE TO BE FULL SIZE OF OUTLET "O"
GATE VALVE
SAME SIZE AS RETURN PIPING
TO RETURN HEADER OF BOILER
SWING CHECK VALVES HAVING SEATS INCLINED AT AN ANGLE OF 45° LOCATE PIPE ON LEVEL WITH WET RETURNS.
FLOOR
BLANK FLANGE
WET RETURN

Fig. 4. Arrangement of Piping Around Boiler Trap and Vent Trap

Size Boiler-return Trap	Rating sq. ft. Direct Radiation	Dimensions	Tappings			No. of ½-in. Vent Valves	Size of Vent Trap	Tappings		
		H	O	S	E			R	U	V
0023	1500	14¼	1½	¾	½	1	0023	1	1	½
023	2500	16¾	2	1¼	½	1	023	1	1½	½
123	4000	18¾	2½	1¼	½	1	123	1¼	2½	1¼
223	8000	23	3 flg.	1½	¾	2	223	1¼	3 flg.	1¼
323	16000	26¾	3½ flg.	1½	¾	3	323	1¼	3½ flg.	1¼

All dimensions in inches

Table for Sizing Connections Around a Webster Boiler Return Trap

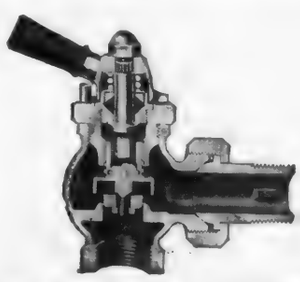


Fig. 5. Webster Type "W" Modulation Valve

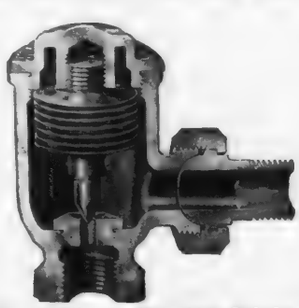


Fig. 6. Webster No. 512 Sylphon Trap

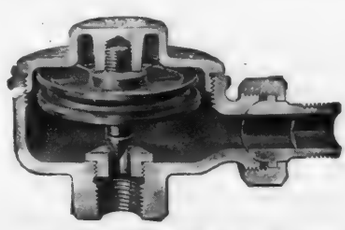


Fig. 7. Webster No. 7 Trap

The modulation supply valve is constructed as shown in cross-section in Fig. 5. It is of the quick-opening, non-rising stem type and built for quick opening or closing with less than a

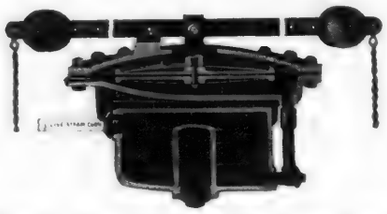


Fig. 8. New Design of Webster Low-Pressure Damper Regulator

complete turn of the handle. The modulation effect is produced by a scientifically curved plug, which varies admission of steam in progressive volume with the lift of the valve piece.

Fig. 6 is a cross-section of the Sylphon thermostatic trap. The expansion member consists of a Sylphon bellows, carrying a conical-shaped valve piece, closing against a sharp-edged seat. The bellows member is very sensitive, opening to pass condensate and air, but closing to prevent passage of the steam.

Another trap sometimes used by the same organization is known as the No. 7 Trap. (See Fig. 7.) It is of the multi-diaphragm type, built of four successive phosphor-bronze plates and its operation is similar in principle to other diaphragm types already described.

The last important item in this system is the sensitive, low-pressure, damper regulator, for maintaining the desired boiler pressure within a very few ounces of that for which it is set. As can be seen in the cross-sectional view (Fig. 8), it consists of a lower chamber partially filled with water. From the bottom of this chamber a small pipe is carried up and connected to the space below the diaphragm, so that any pressure exerted on the surface of the water in the lower chamber will result in drawing the water out through the pipe and into the upper chamber, where it exerts an upward pressure on the diaphragm, causing a movement of the lever arm which, in turn, operates the dampers.

The steam correction from the boiler may be made through either the tapping at the left of the water chamber or the tapping in the center of the bottom. The bottom connection may serve also as a means of mounting the damper regulator directly on the boiler.

After passing through the radiator the air and condensation escape through the opening of the Dunham radiator trap (Fig. 3) which is purposely made large and unobstructed.

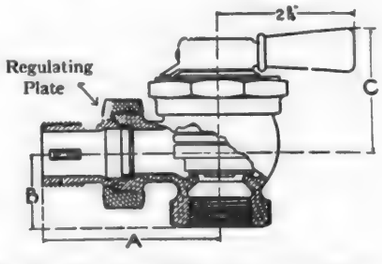


Fig. 2. Dunham Packless Inlet Valve with Regulating Plate

When the radiator has filled with steam and the steam surrounds the thermostatic disc in the trap, the volatile fluids within the disc are heated and vaporized, thereby creating a pressure within the disc. This internal pressure expands the disc, the valve seats over the opening, and waste of steam is prevented. Subsequent water and air forming in the radiator fall to the bottom, surround the disc, condense the gases within it, and the disc contracts, raising the valve from its seat and allowing the air and water to pass out into the return line. Steam, following behind the air and water, causes the disc again to close. The trap soon adjusts itself to a position corresponding to the water temperature, just as a thermometer does to the room temperature and permits a continuous flow of water from the radiator.

The Dunham radiator trap is for use on all two-pipe steam heating systems using steam above or below atmospheric pressure. It can be applied on either steam or water-type radiators. The use of water-type radiators is recommended, however, as circulation through the radiator takes place more quickly and at a lower steam pressure.

The Dunham Home-Heating System

REVISED data on the Dunham system (Data Sheets 132-K revised and 132-L revised) show some important developments, notably in connection with the use of a regulating plate in the packless inlet valve for controlling the steam flow to the radiator in proportion to the size of the radiator.

In this system, as developed by the C. A. Dunham Co., Chicago, Ill., the piping is arranged as shown in Fig. 1, illustrating the method of running the piping in the heating of residences.

This is a two-pipe system, with each radiator having a thermostatic trap to prevent the steam from entering the return line, and, in that way, accomplish a saving of fuel and elimination of pounding in the pipes and radiation.

The steam passes from the boiler into the steam main in the usual manner and up to the radiators, into which it flows through the Dunham packless inlet valve (Fig. 2).

This valve utilizes a series of diaphragms for allowing the free up-and-down movement of the spindle without steam leakage. This construction of the Dunham valve permits it to be partially opened and closed at will, also regulating the flow of steam to the radiator in proportion to the size of the radiator by means of the regulating plate placed on the valve discharge.

This valve can be used on any two-pipe steam heating system, either vapor, vacuum or pressure. It is made in lever-handle type and wheel-handle type. This valve is designed to secure uniform steam distribution to the radiators.

RADIATOR CONNECTIONS

Sq. Ft. Radiation	Inlet Valve In. Dia.	Horizon. Runout In. Dia.	Return Outlet In. Dia.	Horizon. Return In. Dia.
1-80	¾	1	½	¾
81-140	¾	1¼	½	¾

The company advocates the use of pipes one size larger for horizontal steam connections, spring pieces and runouts, over 8 ft. long, and the grading of horizontal connections with a fall not less than ½ in. per foot.

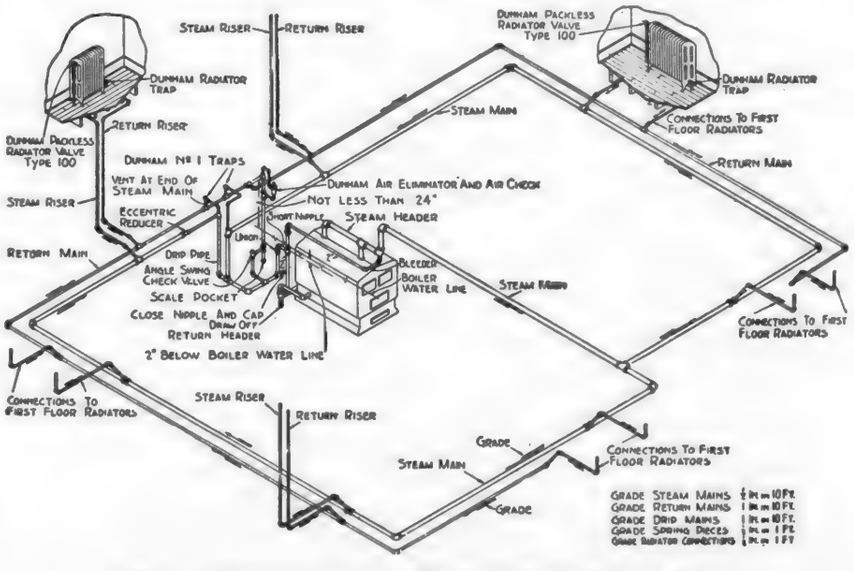


Fig. 1. Typical Layout of Dunham Home-Heating System

The traps comform with the standard dimension of 3¼ in., from center of trap to end of union nipple, as adopted by the Heating and Piping Contractors' National Association for ½-in. radiator traps.

The steam main pitches down to the point where the last radiator connection is taken off. Here an air vent is located to relieve the air, the pipe being

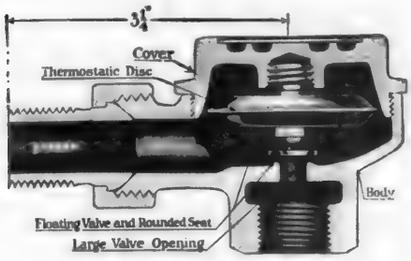


Fig. 3. Dunham Radiator Trap

run to a Dunham No. 1 trap, which permits the air to escape into the return line, while the condensation flowing along the main is relieved by a drip at the end of the main which drops down under the water-line and is connected to the boiler.

The return main runs parallel with the steam main, with a view of obtaining even distribution of heat, and pitches down in the same direction. At the end of the run the condensation passes a check valve to the boiler return, while the air is relieved to the atmosphere through the Dunham air eliminator. The low level of the return main must be kept at least 24 in. above the boiler water-line, so as to permit the air to be released properly.

The Dunham air check, when used with the air eliminator, acts to prevent the air from flowing back into the piping and radiators, with the result that a partial vacuum forms in the system, allowing the water in the boiler to be boiling at temperatures below 212° F. In this manner a prolonged firing period with economy in fuel consumption, as well as uniform heat supply, may be secured. In cold weather pressures slightly above atmospheric are used for heating, while in mild weather, or when building is heated up, a vacuum of several inches is sufficient. The returns are connected 2 in. below the water-line of the boiler, using the method recommended by the Hartford Insurance Company.

Next month: The Illinois System and Hoffman Controlled Heat.

New Ordinance on Gas Tubing for New York

A new section of the Sanitary Code of New York City, effective August 1, stipulates that no flexible gas tubing can be offered for sale until it has been registered with the Board of Health and a certificate of registration issued, certifying that the tubing has been examined, tested and found to comply with the regulations of the Board. Violation of the article is a misdemeanor punishable by a fine of $500 or imprisonment for one year, or both.

It is further stipulated that if any flexible gas tubing already in use is found to be defective or imperfect or leaky or fraudulently marked or registered, it may be seized by a representative of the Board of Health and confiscated.

Numerous deaths by accidental asphyxiation have resulted in New York City from the use of defective flexible gas tubing in connection with gas stoves, heating apparatus and other gas appliances. The action taken by the Board was strongly recommended by gas companies serving the Greater New York territory.

According to Alexander Forward, secretary-manager of the American Gas Association, the tubing specifications recommended by the Board of Health are largely those adopted by the American Gas Association for national use as a result of tests and research made at the Appliance Testing Laboratory in Cleveland, Ohio.

The Building Situation

Construction carried forward into 1926 from last year, together with the large amount of work and undertaken this year, continues to be a powerful stimulus to general business, says the National Bank of Commerce. The report goes on to say that contracts awarded in 1926 should compare favorably with last year, although it is probable that declining awards in the second half will bring the total under that of 1925. New construction is still needed in many localities, but overwhelming demand, as a driving force, appears to be losing its power.

In periods of heavy construction in the past, as building approached its maximum volume, a raising level of business activity had tightened money rates. This brake has tended to curtail construction before overbuilding has gone very far. At present, however, easy money is leaving the boom to be stopped entirely at the other end, namely, through lower returns on capital invested when the supply of buildings becomes too large even for the demand for this era of prosperity.

Less urgency in the demand for building space is bringing construction costs back into prominence as a factor in the building situation. Building costs have achieved relative stability for the last three years by striking a balance between slightly rising wages and weakening material prices. The level, however, is high. As rentals gradually decline, reducing the return on capital invested, the necessity for lower costs will become more apparent.

Heating and Plumbing Contractors Urged to Adopt Time-Payment Plan

The Monthly Service Bulletin of the National Trade Extension Bureau for June, 1926, devotes a large part of its issue to the promotion of the time-payment plan, which is recommended to master plumbers and heating contractors for adoption. The front cover depicts a young salesman standing at the front of his store, which deals in heating and plumbing suplies. As he is at leisure, it is assumed that his store is not besieged by customers. His attitude is one to suggest both bewilderment and contemplation, as he watches people going into the stores on the opposite side of the street. These stores are selling musical instruments, rugs, furniture, radios. Each of them displays a sign which reads "Time Payments", "Dignified Credit" or "Installments." A statement at the bottom of the illustration reads, "Waiting for Customers Versus Waiting on Customers."

The *Bulletin* points out to the dealer the advantages of mail advertising and shows one of ten circular letters written for the purpose of interesting the purchaser in the time-payment plan for heating or plumbing appliances. These letters are furnished the dealer desiring them by the National Trade Extension Bureau, which adapts them to his particular needs.

Under the heading "A Newly-Opened Road to Sales for the Master Plumber or Heating Contractor," the *Bulletin* states that these dealers are not competing favorably with merchants in other trades, and stresses the advisability of the installment plan as a remedy for the condition. It tells how the plan may be put into practice by the contractor, and how prices may be figured so as to avoid necessary additional capital or overhead expense.

Tables showing the extent to which the plan is employed by other branches of business are given. One table shows the volume in dollars of installment buying in other lines and another the per cent of total sales made on the installment plant.

"Do Your Ads Do These 4 Things?", is asked on another page,—"Attract Attention, Arouse Interest, Create a Desire for Your Goods, Induce Action"? Two samples of advertisements designed for the heating and plumbing industries are shown. These advertisements, which are supplied by the T. E. B. for use in newspapers, call attention to the appliances and tell how they may be obtained from the dealer on easy-payment terms.

Another article, on the economic side of the installment plan, states that this method is more satisfactory to the customer and more dependable than the open account since the customer, in the latter case, may be unable to meet his obligation because of lack of foresight.

New Apparatus and Appliances

A New Boiler-Feed Water Regulator

The development of a boiler-feed regulator which operates without a float, generator, link or thermostat is an achievement announced by the Atlas Valve Co., 282 South St., Newark, N. J. The regulator is described as a simple hollow casting with an inlet, an outlet and a pressure port. As an illustration of its simplicity, it is stated that if the water level in the boiler is to be maintained at the middle gauge cock, the lower end of the "supply pipe" extending down into the water column is made to terminate at that point. In that way, the water in the boiler will not go higher or lower than the position of the open end of the pipe.

If the water in the water column is slightly below the lower or open end of the supply pipe, steam would then be passing into the regulator through a very small orifice. The orifice is so small that the pressure of the steam drops as it passes into the body of the regulator. It drops to about 10% of the boiler pressure. This steam then passes out of the regulator body through a second orifice which is slightly larger than the inlet orifice. These orifices are so proportioned that the pressure in the regulator is maintained at about 10% of the boiler pressure, as stated. This reduced pressure acts on the diaphragm of the control valve shown at the right in the accompanying illustration, through the connecting pipe. As 10% of the boiler pressure is not sufficient to close the control valve, that valve remains open and water continues to be fed into the boiler. This continues so long as the water in the boiler is below the entrance to the supply pipe water. As soon as the water reaches the inlet of the supply pipe, hot water, instead of steam, flows into the regulator through the orifice.

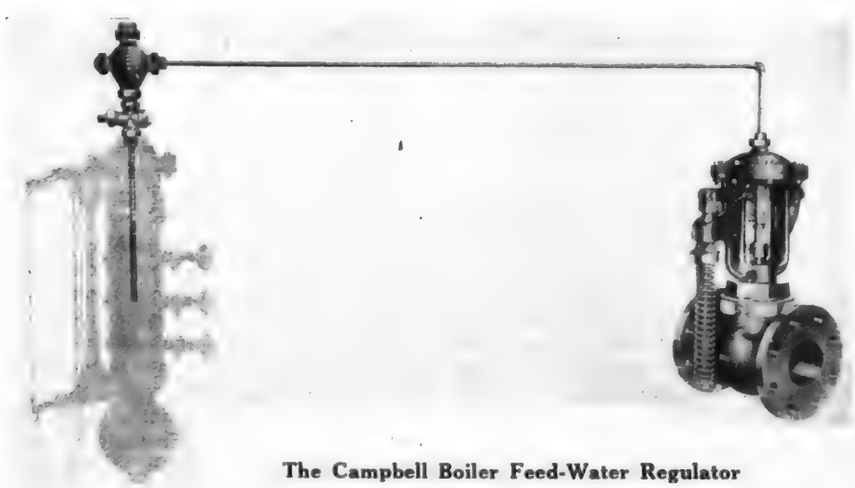
Immediately, some of that water flashes into steam and a pressure within the regulator equal to nearly 60% of the boiler pressure is created. When this high pressure acts on the diaphragm of the control valve, the valve closes tight and water ceases to be fed into the boiler. As soon as the water level drops below the opening to the supply pipe, live steam once more flows into the regulator, the pressure drops, the control valve opens and water is fed into the boiler. It is known, of course, that more heat passes through an orifice in a given time in the form of hot water at steam temperature than in the form of steam at the same temperature. This, briefly, is the principle upon which this new boiler feed-water regulator is based.

Although this unit is small and compact, it is described as powerful enough to operate the largest high-pressure feed-water control valve. The control valve, it is stated, will operate in any position, in any height above or below the water level and at any distance removed from the boiler. It cannot be air bound because the air will pass through the regulator with the steam and will act in the same manner as steam.

The Campbell regulator, it is stated, is applicable to all sizes and types of boilers, including water-tube, fire-tube, horizontal and vertical. In the matter of leakage, which might occur through the control valve when the load is light or when there is no load at all, this possibility, it is stated, is obviated with this regulator because the single-seated control valve with renewable disc entirely shuts off when the water level is high.

Any type of pump governor may be used with the regulator, either the constant-pressure or excess-pressure type. Where one feed pump serves one boiler, no pump governor is required, as the control valve, installed in the steam supply to the pump, governs the speed of the pump in accordance with the water demanded by the boiler.

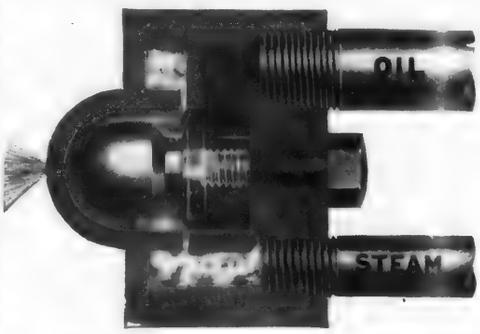
In a test on the Campbell regulator, made at Stevens Institute last year by Professor Robert M. Anderson, professor of mechanical engineering, he states that, "the maximum fluctuation in the level of the water in the boiler during the test has been approximately 1 in."



The Campbell Boiler Feed-Water Regulator

The P & B Burner

A new industrial type of oil burner, built in three parts, is being manufactured by F. Beers & Co., Federal Trust Building, Newark, N. J. It is described as being adaptable to any kind of flame and to be suited to any type of furnace. The burner protects itself from over-heating by absorbing into the steam used for atomizing, the heat that is radiated through the cap.



Section of P & B Industrial Burner Nozzle

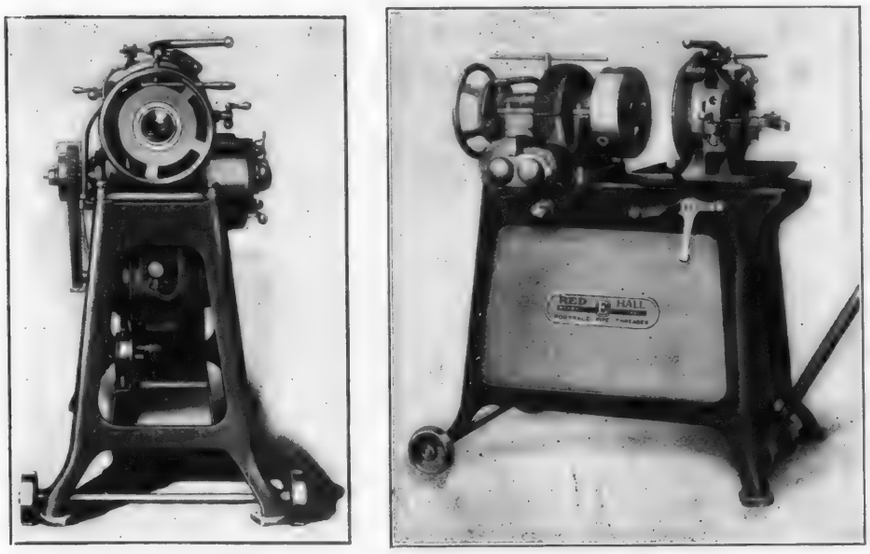
In the atomizing process four steam jets are employed, all acting at right angles to four oil jets. It is stated that this design reduces the steam consumption 1.3%.

New Model O-E Supply Valve and Radiator Trap

Under the name of the improved O-E packless valve and the O-E No. 5 thermo-nickel trap, the O-E Specialty Mfg. Co., Milwaukee, Wis., announces new models of each of these specialties. The trap is built for direct unit of less than 100 sq. ft. capacity. It has a self-cleaning vertical seat and the diaphragm is of heavy cross-rolled non-corrosive material. It is guaranteed to remain closed at 0—25 lbs. and 0—13 in. vacuum.

A Portable Electric Pipe Machine

Announcement is made by Hall-Will Inc., Erie, Pa., manufacturer of precision-production machines, of a new portable electric pipe machine which is known as the Red-E-Hall pipe threader. This machine has a capacity for from ½-in. to 2-in. pipe, and from ½-in. to 1½-in. bolts. It can also be made into a power unit, with a universal joint to drive stocks up to 12 in.



Two Views of Red-E-Hall Portable Pipe Threader

The machine is designed as a portable pipe threader, but can easily be made stationary. It is equipped with a built-in truck which elevates it instantly for portable operation. The rear feet of the machine are mounted on small wheels; the front feet on double swivel castors which elevate the front of the machine when the handle is moved forward. Three speeds, one of which is extra fast for cutting off, are provided. Changes are made by the selective slide system; there is a neutral position between all shafts. The machine is of malleable iron and steel construction, and weighs 450 lbs.

A 1-H.P., 1750 r.p.m. reversible motor is bolted to the main frame and connected to the machine by a silent chain drive. The oil pump is rotary geared, reversible and driven direct by a motor at constant speed. Being on the level of the reservoir, it is always primed.

Electrothermostatic Control Equipment

A set of electrothermostatic control devices for the automatic regulation of temperature in practically all applications, both residential and industrial, has recently been brought out by Drying Systems, Inc., Chicago. This equipment was described by George Fabrice, Jr., of that company, before the National District Heating Association at its recent convention at Niagara Falls. The set consists of a Style M thermostat and a Style C valve or damper motor.

The Style M thermostat, when used with the Style C valve for temperature control in buildings heated from a central station, is installed within the building, to be controlled, in a location reasonably free from drafts or abnormal temperature effects. The function of the instrument is to open or close an electric circuit (to the Style C valve) in accordance with the rise or fall of temperature above or below the instrument setting.

In this instrument, the lower head of an expansible metal bellows is affixed to the die-stamped frame in such a manner that the upper head is free to move vertically against the yoke. This bellows is filled with a gas which is sensitive volumetrically, to changes in temperature. The temperature of the air surrounding the bellows, because of the surface afforded by the convolutions, is quickly transmitted through the metal to the confined gas. A rise in temperature expands the gas and causes the bellows to expand or elongate, while a fall in temperature contracts the gas, causing the bellows to contract or shorten. As the bellows expands the upper free head moves the yoke upward; as the bellows contracts this head permits the yoke to move downward, under the tension of the spring attached to the lower end of the yoke.

Pivoted above the bellows is a metal bracket which supports a mercury tilt switch. The bracket is provided with an extension which rests against a pin carried by the upper end of the yoke. The bracket bearing is placed off center so that the extension is held against the pin by gravity.

Thus, as the bellows expands or contracts upon rise or fall in temperature, the motion is transmitted to the bracket, tilting the mercury switch and thereby causing the globule of mercury to move from one end of the glass tube to the other. Within one end of the tube two metal contacts are provided, the metal leads thereto being sealed into the glass. When the tube is in such position that the mercury globule surrounds the contacts, the mercury establishes a positive metallic electric circuit between the two contacts. When the switch is tilted to the opposite position, and the mercury globule flows away from the contacts, the circuit is as positively broken.

The pressure required to move the yoke, and therefore the temperature at which the gas pressure within the bellows will move the yoke, is regulable by means of the tension spring attached to the lower end of the yoke, the tension of this spring being adjustable by means of a screw, actuated by a knurled head at the bottom. The knurled head projects through the cover. A figure scale is carried on the spring collar, and the temperature at which the thermostat will operate is that which shows through the circular window in the cover.

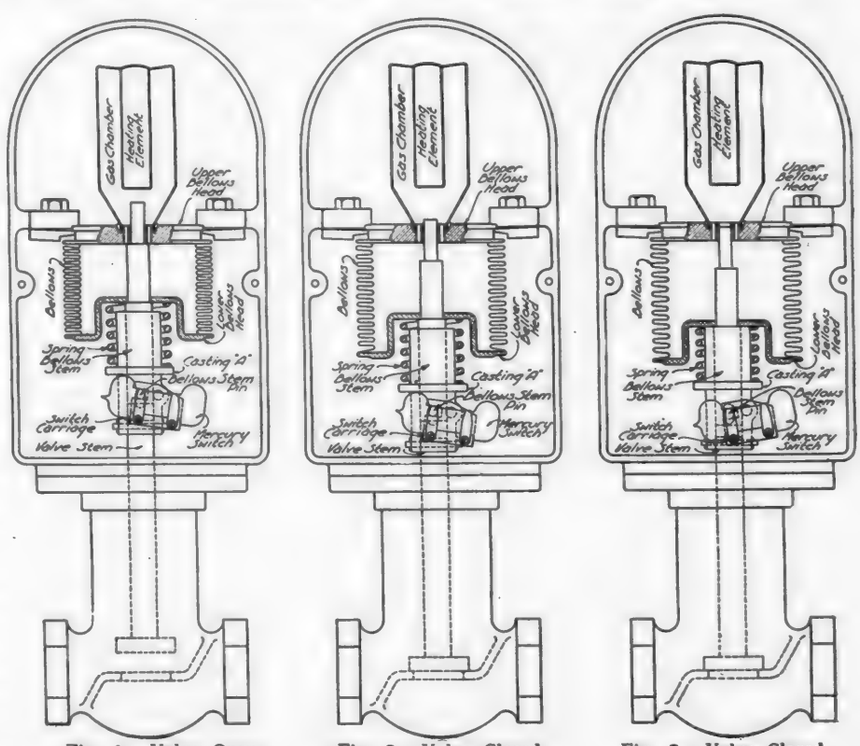


Fig. 1. Valve Open, Switch On

Fig. 2. Valve Closed, Switch On

Fig. 3. Valve Closed, Switch Off

Three Views of Style C Valve Showing Operation

The Style C valve, when used with the Style M thermostat for temperature control in buildings heated from a central station, is installed in the steam or water supply or return line leading to or from the building, or part thereof, to be controlled. In a residential installation the Style C valve is installed in the supply or return line at a point just beyond or before that at which the line enters or leaves the house; usually in the basement.

The Style C valve must be installed in a horizontal pipe. The function of the valve is to open or close in accordance with the heat demand, as controlled by the electric current permitted to flow through the Style M thermostat. The Style M thermostat and the Style C valve are therefore connected electrically in series with each other, across the current mains supplying the building.

In the operating mechanism of this valve an expansible metal bellows, filled with a gas volumetrically sensitive to temperature changes, has its upper head attached to the fixed half of the valve head casting. The lower head of this bellows bears against a compression spring which bears against a bronze casting, within which a stem protruding from the bellows head is guided, free to move vertically through the casting, within the limits fixed by a slot in the casting and a pin through the stem at right angles thereto, the pin engaging the slot and extending through to engage a second casting pivoted to the first casting and carrying a mercury tilt switch. The lower end of the bronze casting carries the valve stem itself, which is pinned to it.

Above the bellows, rigidly attached thereto and communicating therewith, is a closed cylindrical vessel, as shown in the line diagrams. The vessel, communicating with the bellows, is also filled with temperature-sensitive gas.

When the temperature of the air in the space containing the Style M thermostat rises, the mercury switch of the thermostat is tilted to the "on" position and current flows to the Style C valve, passing to the heating element, since, in the normal open position of the valve, the mercury switch of the valve is closed or "on."

As the heating element transmits heat to the gas in the surrounding chamber, the gas expands and forces the expansible bellows downward.

At the beginning of the downward stroke (see Fig. 1), the pin through the bellows stem, which engages the switch carriage, is at the top of the slot in the casting A. Since the resistance of the compression spring is greater than the pressure required to close the valve, the bronze casting A to which the valve stem is affixed, and against which the spring bears, is forced downward, thus closing the valve, while the pin through the bellows stem remains at the top of its slot, the mercury switch remaining in the closed or "on" position (Fig. 2).

When the valve is closed the bellows continues to expand, compresses the spring (since the valve stem prevents further movement of the casting A, against which the spring bears) and the bellows stem begins to slide downward through the casting A, carrying the bellows stem pin downward in its slot. As this pin moves downward it tilts the mercury switch to the open or "off" position, thus opening the circuit to the heating element (Fig. 3). Consequently the gas in the bellows and the chamber above it begins to cool and contract, permitting the bellows stem to move upward toward the position shown in Fig. 2. As the bellows stem moves upward, the mercury switch is tilted to the "on" position, again passing current to the heating element which forces the bellows stem downward again.

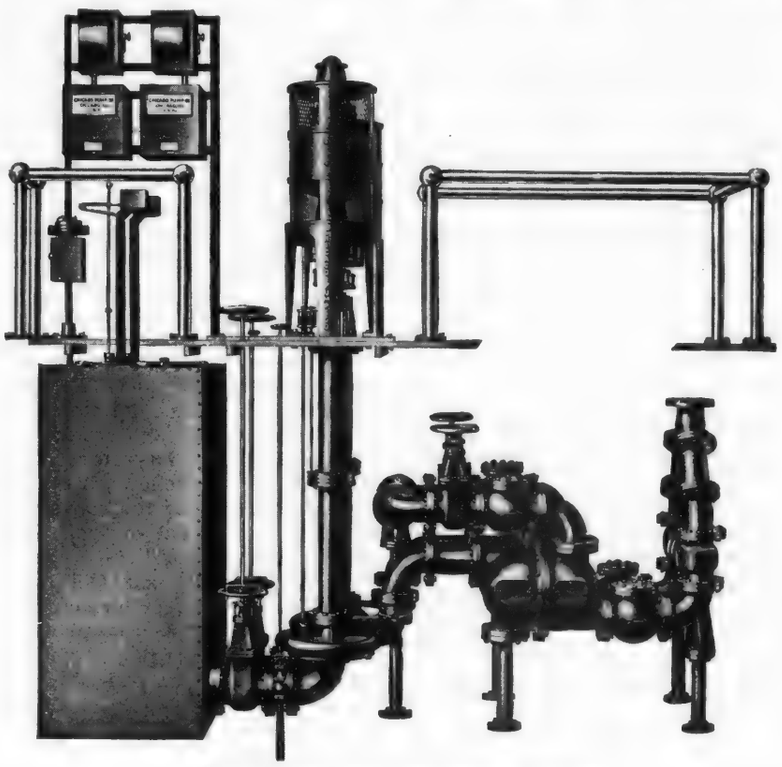
The upward motion, however, does not continue until the bellows stem reaches the position shown in Fig. 2, the mercury switch being tilted to the "on" position soon enough to repeat the downward impulse before the bellows reaches the Fig. 2 position. Thus the valve remains tightly closed, the bellows stem motion being absorbed entirely by the compression spring.

The valve remains in the closed position as long as the controlling Style M thermostat is in the closed, or "on" position, i. e., as long as the temperature in the controlled space is at or above the setting of the thermostat.

When the temperature of the controlled space falls below that for which the thermostat is set, the circuit to the Style C valve is opened, the gas in the bellows cools and contracts, and the valve opens, the stem being pulled upward by the partial vacuum created in the bellows, as well as forced upward by the steam or water pressure in the supply line, which pressure is under the valve.

Sewage Ejector with Screen Cleaned by Reversal of Flow

A recent development in the manufacture of sewage ejectors, as announced by the Chicago Pump Co., 2336 Wolfram St., Chicago, is the Flush-Kleen dry-basin sewage ejector. The Flush-Kleen dispenses with the sewage basket by making use of the flow-reverse method.



Flush-Kleen Dry-Basin Sewage Ejector

The strainer in this ejector is a 1-in. mesh, cast-iron screen, 18 in. in diameter, enclosed in a special cast-iron housing. The strainer chamber is placed in the ejector pit between the inlet and the pump casing, so that all sewage entering the wet basin must first pass through this strainer, and then through the pump into the basin. When the water rises to a predetermined height in the wet basin, an automatic switch causes the pump to reverse the flow of water, pumping the water out of the wet basin, through the strainer and into the sewer. Solids and foreign matter collected by the screen are carried into the sewer by this outward flow of water. The velocity of the reversed flow, it is stated, is four or five times greater than that of the water when it enters the basin, and it is added, is sufficient to discharge any foreign matter that may be in the screen.

The Flush-Kleen dry-basin sewage ejector is described in Bulletin 126, issued by the Chicago Pump Company.

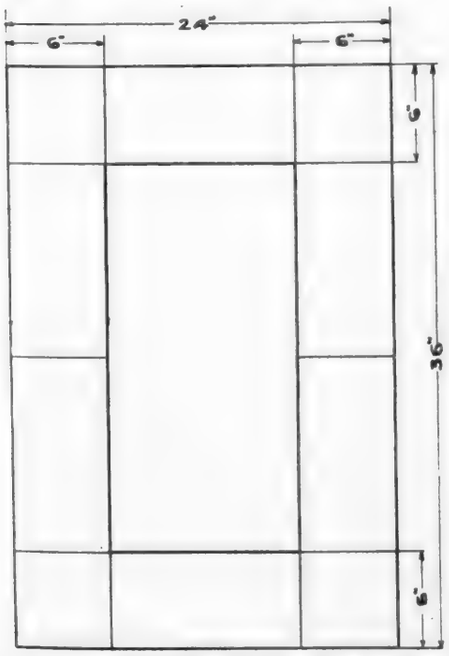
Placing Foundation of Absorbo under Two 60-in. Blowers

Photographs and blue-print drawings illustrate its operation. Engineering tables and specification forms for architects and engineers are also included. On the last page is a list of 55 of the company's sales representatives. Size 8½ x 11. Pp. 16.

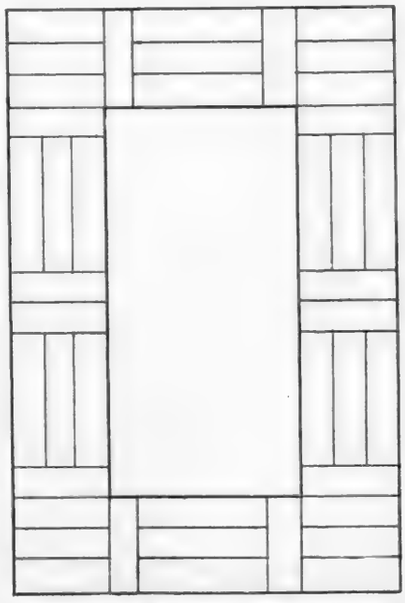
Absorbing Vibration with Cork

Impressive evidence of the effectiveness of cork foundations for fans and other apparatus to absorb vibration, is furnished in the form of test data on Absorbo, manufactured by the Cork Foundation Co., 315 Fifth Ave., New York. The novel idea was adopted of using the seismograph for this purpose. The instrument was used to record the vibrations produced in a concrete floor near a motor generator set, before and after the apparatus had been insulated with a layer of Absorbo.

Absorbo is made of prepared strips of natural cork 1½ in. thick, set in rigid steel frames, with lateral braces wherever required. In the process of preparation the cork is impregnated with creosote to render it impervious to oil and water and to preserve its natural oil and moisture. In most installations where Absorbo is used, it is placed under the timber frame of the machine. In foundations for engines, compressors, turbines and large pumping units, it has been advantageous to place it under the concrete base, with a layer between the sides of the base and the concrete foundation to absorb the horizontal vibration.



Metal Frame for Absorbo Cork Strips



How Cork Strips are Placed in Frame

New Heating Cabinets Developed by Peerless

To meet the demand for better-looking and more efficient equipment for heat radiation, especially in residences, apartment buildings and hotels, a new type of heating cabinet has been developed by the Peerless Unit Ventilation Co., Long Island City, N. Y., to take the place of ordinary cast-iron radiators. The new unit, which is known as the Peerad heating cabinet, not only lends itself to decoration in harmony with the room where it is used, but has distinctive features from an engineering standpoint.

The cabinet is made of furniture steel, in various heights and widths, depending on the amount of radiation required. The thickness of the standard unit is about equal to the depth of ordinary radiators. There is an opening in the

Peerless Heat Cabinet

bottom of the cabinet for the entrance of the air to be heated, and an outlet opening, covered by a grille, near the top. The outlet opening is provided with a shutter, which can be opened or closed as conditions require. Circulation of air is effected by gravity, and the heating is provided by means of a built-up copper radiator. Equipment for humidifying the air can be provided within the cabinet.

Special adaptations are available for built-in units with an intake near the floor line and outlet at any point desired.

A New Vapor Thermostat

A new vapor thermostat, known as Klipfel No. 48, is announced by the Klipfel Mfg. Co., Chicago. This vapor thermostat has been especially designed for controlling any desired temperature range between 140° and 180° F. It can be made, however, for other temperature

ranges. This valve has been designed with a minimum number of moving parts, the inner-valve and the bellows. Both are accessible, should it be necessary to remove or replace them, by removal of the brass screws from the bellows chamber and bulb bushing. The bellows are especially strong, as Klipfel construction permits the use of cross-rolled bronze of high tensile strength. The corrugations are formed so as to provide the greatest strength and flexibility. The bellows are all metal and are described as "the ultimate in sensitiveness." This type of bellows, it is stated, will move the steam-controlling valve an unusual distance, making this control exceptionally accurate and close.

The semi-balanced bevel-seated bronze inner-valve is normally held open by the weighted lever. When the temperature of the tank water or gases rises above the point for which the weight has been adjusted, the volatile fluid

Klipfel No. 48 Vapor Thermostat

(hermetically sealed within the temperature-sensitive bulb) boils, increasing the pressure in the all-metal bellows. This increase in pressure serves to overbalance the weight, and closes the steam supply valve.

The Klipfel vapor thermostat No. 48 is entirely self-contained and is of all-metal construction. This valve is available in sizes from ½ in to 6 in.

A New Ceiling-Mounted Portable Unit Heater

The breach between the respective advocates of floor-mounted and ceiling-mounted portable unit heaters, which has now become sharply defined in engineering circles, is given fresh emphasis through the announcement by the Buckeye Blower Co., Columbus, O., of the Buckeye Type E Thermovent, a unit of the ceiling-mounted type, although it can have a floor connection. Devoting almost the whole of its new catalog to the Type E Thermovent, the company's preference for that unit is made even more emphatic by the mention, on the last page, of the vertical Type F Thermovent, a floor-mounted heater, which is offered to meet the demand for such a heater, but which, it is admitted, occupies valuable floor space and is not adaptable for overhead return.

Installation of Type E Thermovent, Showing Sheet-Metal Ducts for Air Distribution

Two outstanding features of a ceiling-mounted unit are emphasized; namely, that it has access, under normal conditions, to the warmest air in the room, and that it is in a position to provide a greater and more even distribution of air than any other type.

The Thermovent unit consists of two fans, driven by a single spring-mounted motor. The air is forced through a copper-tube radiator. The heating element is enclosed in a sheet cabinet to which may be attached ducts of any design that may be required to provide proper distribution of the air supply. Type E is mounted on a wood base equipped with channels for attachment to the ceiling. The catalog contains line diagrams of sections of the heater and of typical installations. The unit is considered with regard to cost, installation, space required, operation and maintenance, air distribution and diffusion, and control. Tables of sizes, specifications and engineering data are included for both Types E and F. Typical sheet metal connections and diffusers for use with the unit are shown. Size 8½ x 11. Pp. 20.

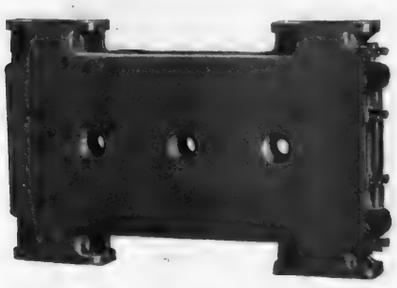
INDUSTRY'S ELECTRICAL PROGRESS is the title of an attractive publication in book form distributed by the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Among the topics discussed are the progress of electricity in industry, examples of production economics, the duty of motor controllers, and what to do when considering motor-driven equipment. Progress made in the last few years in electrical apparatus is pointed out, along with examples of the accomplishments of correct motor controls. Numerous illustrations are shown of the mechanical equipment of various types of plants in which Cutler-Hammer control devices are in evidence. Size 6¼ x 9¼. Pp. 35.

View of Type E Thermovent, Showing Fans, Motor and Heating Element

New Trade Publications

LAMMERT OIL BURNING EQUIPMENT is the title of catalog No. 16 of Lammert & Mann Co., 215 North Wood St., Chicago, devoted to the essential details of the various auxiliary units necessary to efficient burning of liquid fuel. The units described and illustrated, with specifications and details of their operation, include rotary compressors for combustion, combination oil and air supply units, air- and water-cooled compressors and portable units. Emphasis is placed on Lammert No. O burner for domestic use. This automatic, direct-connected unit of the atomizing type, is designed to deliver to the nozzle a uniform flow of air at any desired pressure up to 5 lbs. per square inch, and oil at any pressure up to 25 lbs. per square inch. The unit is composed of an air compressor with a capacity of 3 cu. ft. free air per minute at 1150 R.P.M., a ¼-in. oil pump and a ¼-H.P. motor mounted on a special bedplate. Both the compressor and oil pump operate at motor speed. The compressed air passes through an oil-reclaiming device cast in the bedplate, which separates out any lubricating oil that may be carried over by the exhaust. The reclaimed oil drains into a sump and is automatically fed back into the bearings by forced feed. Included in the unit are all necessary auxiliary appliances, such as a foot valve, strainer, air and oil gauges, oil relief valve, anti-syphoning valve, nozzle and pilot light. These auxiliary parts are shown and described in detail. Size 6¼ x 9¼. Pp. 27.

BRYAN HEAT GENERATORS for steam, vapor, vacuum or water heating, designed especially for oil or gas fuel, are described in catalog No. GC-15, issued by the Bryan Steam Corp., Peru, Ind. The catalog gives a full explanation of the Bryan heat generator, with particulars of its assembly and operation. Emphasis is placed on a new attachment to the heater in the form of a water coil on the inside of an end water column. This coil takes the place of an auxiliary heater to supply hot water for domestic use and serves the same purpose as the four individual corner columns originally used in this heater. A section of the catalog is devoted to a description of the interchangeable tube sections in the boiler. It is stated that any one of the tube sections may be removed and replaced without disturbing any of the other tubes. Illustrations of separate parts of the heater and sectional views of the assembly are shown. Tables are given of gas consumption, specifications of the Bryan generator and the square feet of heating surface for various sizes of four kinds of cast-iron radiators. Described in the catalog are the Honeywell motor valve, the Honeywell vaporstat. Types Q and R thermostats, and McAlear duplex water feeders. A diagram is shown of the arrangement of thermostatic control devices for gas burning. Size 6 x 9¼. Pp. 32.



End Section of Heater Equipped with Water Coil

Tube Assembly of Bryan Heat Generator

MUELLER STEAM SPECIALTY CO., INC., 502 West 126th St., New York, in its Catalog No. 22, gives illustrations and descriptions of steam, water, air, oil and gas specialties, consisting of pressure-reducing and regulating valves, strainers, boiler controls, steam traps, float valves, quick-opening balance valves, pump governors, air traps and liquid level controllers.

Water Coil Removed from End Section

MASSACHUSETTS MODIFIED SQUIRREL CAGE FANS is the subject of a catalog in colors (A. I. A. File No. 30 D 1) issued recently by the Massachusetts Boiler division of the Bishop & Babcock Sales Co., Cleveland, O. The catalog contains full performance data presented in the form of graphs on green-ruled paper; also capacity tables, characteristic curves, dimensions, weights and arrangements of modified Squirrel Cage fans. The catalog is especially compiled for the use of architects, consulting, and heating and ventilating engineers. Size 8½ x 11. Pp. 26.

SPECIFICATION FOR THE GORTON SYSTEM OF VAPOR HEAT (A. I. A. File No. 30) has been issued in convenient form for the use of the owner, architect and heating contractor by Gorton & Lidgerwood, 96 Liberty St., New York. The specifications include the items of boilers, chimneys, smoke-pipes, piping system and radiation, as well as painting and bronzing, floor and ceiling plates, covering, cleaning of system and guarantee. Under the heading of "Specialties", the appliances used in the Gorton system are given, together with the necessary instructions for installation, and the valve schedule. The guarantee covers the proper operation and functioning of the system, as being capable of heating all rooms including radiators, to 70°, except wherever specified and with an outdoor temperature to be specified, with a pressure of not more than 12 oz. at the boiler.

MCALEAR HEATING SPECIALTIES, manufactured by the McAlear Mfg. Co., Chicago, are featured in a catalog, designed for insertion in either Kalamazoo binders or T.E.B. binders. This catalog, it is stated, is the first of its kind, devoted to heating specialties, to be gotten up in this fashion. It contains perspective and sectional illustrations, along with descriptions, tables of sizes, weights, prices and capacities of the McAlear line of packless radiator supply valves, gas-fuel boiler governors, pump governors, ball-float steam traps, receiver-type steam traps, flange strainers and sediment strainers. A page is devoted to each type of device; the reverse of the page is in the form of a blueprint giving a layout for a typical installation and the roughing-in dimensions of each specialty. Size 8½ x 10¾ in. (loose-leaf). Pp. 14.

K-Z-POWER WINCH, which can be attached to any make of motor truck, with power take-off facilities and on either side of the chassis, has been brought out by the King-Zeitler Co., 315 North Ada St., Chicago, Ill., and is described in one of the company's recent circulars. Its adaptability in steam fitting work is for heavy pipe or radiators that have to be hoisted to upper floors. For this use, the winch is described as not only a money saver, but a time saver as well. The winch is mounted

View of K-Z Winch in Operation

on ball bearings and derives its power through chain and sprocket attached to the car transmission. Sufficient gear reduction enables the winch to take care of almost any hoisting requirement, providing the load does not exceed 750 lbs. on a single line. The large cone clutch embodied in the unit is designed to operate smoothly without jerking or jarring, while a large quick-acting brake is provided to hold the load at any required position.

BARNES & JONES VACUUM AND VAPOR SYSTEMS OF HEATING are featured in a catalog in colors issued by Barnes & Jones, Boston. The catalog contains a summary of installation experiences in various types and sizes of buildings, with detail drawings of typical connections and photographs showing exterior and sectional views of Barnes & Jones appliances. Many of the illustrations are taken from actual installations. One page is devoted to tables of pipe sizes. Barnes & Jones heating appliances, including modulating valves, thermostatic return valves, condensators, and blast traps are described in detail, accompanied by complete installation directions. Tables of capacities and dimensions are included. The inspection and testing departments in the factory at Boston where the Barnes & Jones appliances are manufactured, are described and pictured in the catalog. Illustrations show the testing of condensators under actual service conditions, the equipment used for testing traps or radiators and a section of the test rack on which each individual valve is tested before shipment. Size 8½ x 11. Pp. 24.

E-Z DAMPER GRIPTITE MUSHROOM VENTILATORS are described in a new circular issued by Aeolus Dickson Co., Chicago, Ill. This type of mushroom differs from the conventional in having a damper practically at the floor level, adjustable by a bolt passing through the top. It is claimed that this method of securing control of air flow minimizes the objectionable drafts that result when the average type of mushroom is nearly closed. The Griptite feature consists of spring steel strips extending down into the concrete, with outwardly extending points, so arranged that, if the metal floor sleeves are withdrawn, these points catch on the rough concrete and hold the mushroom in place.

LIQUIDOMETER JUNIOR, a tank-contents gauge, is described in a four-page folder issued by the Liquidometer Co., Inc., Long Island City, N. Y. This gauge, which is designed primarily for use in connection with oil-burner installations, consists of a float attached to a movable arm which transmits the motion of the float through a length of tubing to a dial. The device is held in place in the tank by a flange and nipple. Thirty feet of flexible tubing are supplied with the instrument.

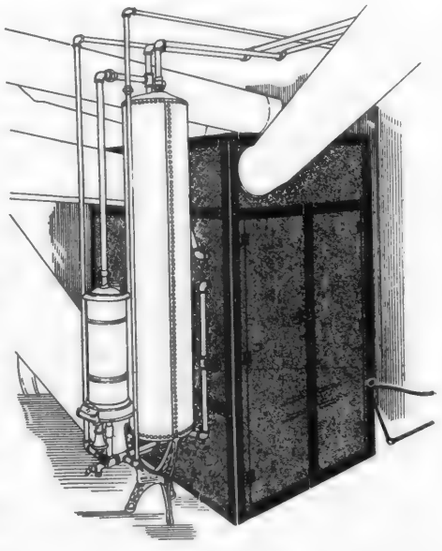
CAN WE COMPETE ABROAD? is the title of a book by C. C. Martin, published by the National Foreign Trade Council, India House, New York, dealing with the success of foreign representatives and sales offices of numerous American industries in competition with foreign firms. Reasons for the preference in foreign countries for American products are given, and the opportunity for further development is emphasized. Pp. 155. Paper bound. Price 25 cents.

DEVELOPING MACHINERY MARKETS ABROAD is the title of a publication issued by the Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C. This booklet has been prepared to assist manufacturers of machinery in solving their export problems. It indicates concisely the methods that have been successfully used in distributing American machinery throughout the world. Pp. 17. Gratis.

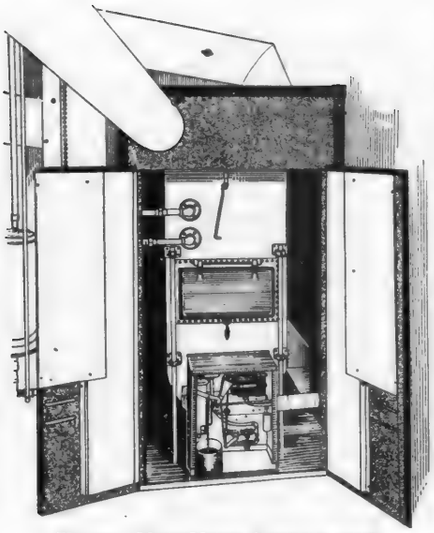
THE MENACE OF THE WOODEN SHINGLE is the subject of a new illustrated pamphlet issued by the National Fire Protection Association, 40 Central St., Boston, Mass., designed particularly for use in promoting legislation requiring the use of fire-proof roof covering. Pp. 18. Price 10 cents.

H-K (HOLBORN-KURLBAUM) OPTICAL PYROMETERS are described in Bulletin 293, issued by the Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh. In this instrument the intensity of the light from incandescent bodies is compared to that of a calibrated light filament as a standard. The methods employed are either to bring the hot body to the same brightness as the filament by a polarization apparatus, or to vary the intensity of the standard until it has the same brightness as the hot body. The instrument consists of a lamp filament connected in an electric battery circuit with a milliameter and a rheostat. The filament is placed in a telescope consisting of an ocular lens, a smoked-glass adjusting ring and an objective lens. Either the brightness of the filament is varied by the means of the rheostat, or the temperature of the incandescent body is changed until the body and the filament, looked at through the lens, seem to merge. The temperature of the incandescent body may then be read directly from the milliameter, which is calibrated to read in degrees. The catalog treats black body and non-black body radiation; gives curves of true and apparent temperatures, and tables for applications, method of making determinations and corrections in determinations of temperatures. Size 8 x 11. (Punched for binding.) Pp. 12.

SLAYTER UNIT-HEAT is announced in a folder issued by Games Slayter, Lafayette, Ind. This unit, which is designed for domestic use, consists of a warm-air gas-fired furnace completely enclosed in a cabinet. Entrance to the furnace is made through two doors which open to expose the entire width of the cabinet. The burner appliances are located at the front of the furnace just inside the



Typical Installation of Slayter Unit-Heat



Slayter Unit-Heat Cabinet with Doors Open

doors. Pipe connections extend through the cabinet to a domestic water heater on the outside. A small auxiliary heater is supplied for heating water when the furnace is idle.

AMERICAN H. S. FANS (Class 15M) is the title of a catalog (Bulletin No. 7003) received from the American Blower Co., Detroit, Mich., devoted to the latest development of its high-speed, double-inlet fans for forced draft work. Fan wheels, cast-iron inlets, shaft, bearings and pedestals are described in detail. Characteristic curves, specification sheets, capacity tables (Standard Test Code) and dimension sheets, in detail, of all standard arrangements are provided. Size 8½ x 11. Pp. 28.

A NEW GUIDE TO OIL HEAT FOR HOMES, is the title of a catalogue in colors issued by the American Nokol Co., Chicago. The publication is intended for prospective buyers of heating units for the home. Photographs of the Nokol, both of parts and of the assembled heater are shown, along with a graphic explanation of its operating principles. Among the topics discussed are the advantages of oil heat, suggestions for the best use of basement space, cleanliness of proper oil heat, the right and wrong principles of oil combustion and their results, costs and the selection of equipment. A number of photographs of the homes of prominent men which are equipped with Nokol are included. Size 8½ x 10½. Pp. 31.

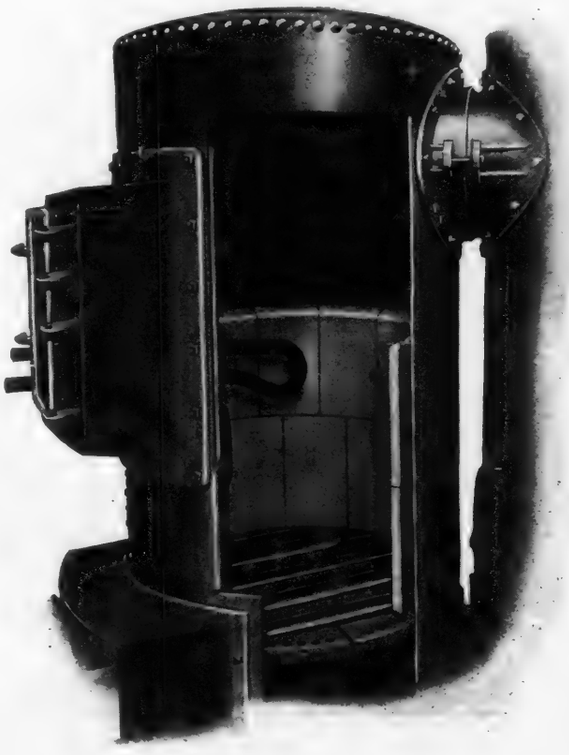
JOHANSEN COMBINATION STEEL BOILER, for use with oil or coal or both, is described in a catalog (A. I. A. File No. 30 c 1), issued by Consolidated Boilers Corp., Benton Harbor, Mich. The boiler, which is of the water-tube type, is divided into two units, one for burning oil and the other for burning coal, or incinerating garbage or rubbish. The units may be operated independently of each other, or they may be operated together. Grates may be placed under both sections, if desired, and the oil burner eliminated. The catalog describes two types of boilers, giving specifications, measurements, and information on their operation and use. The smaller capacity boiler is furnished in 16 sizes, with capacities ranging from 500 to 6,000 sq. ft. of steam radiation, and from 1,000 to 12,000 sq. ft. of water radiation. The larger capacity boiler is made in 15 sizes ranging from 6,500 to 24,000 sq. ft. of steam radiation. Size 7½ x 10½. Pp. 12.

KIELEY HEATING AND POWER PLANT SPECIALTIES is the title of a booklet issued by Kieley & Mueller, Inc., New York, as a supplement to its general catalog. It contains illustrations, descriptions and tables of sizes and list prices of Kieley high-pressure pilot regulating valves, Kieley-Eureka pressure regulators, pressure-reducing valves, float valves, steam traps, continuous-discharge traps, pump governors, back-pressure valves and the new Mueller water feeders. Size 3¼ x 6¼. Pp. 18.

W. N. BEST LOW-PRESSURE OIL BURNERS, for use in low-pressure steam and water boilers, are described in a bulletin issued by the W. N. Best Corp., 11 Broadway, New York. The fact that the company has had 34 years of practical experience in the liquid fuel industry is cited as evidence of its reliability. The W. N. Best burner is designed to atomize the oil externally. When operating at 1½ lbs. pressure and 6 lbs. oil pressure, the burner, it is stated, will atomize any oil of 20° Baumé or lighter without the application of heat. Included in the company's line of equipment mentioned in the catalogue, is a Type C auxiliary unit consisting of a positive pressure blower, direct-connected by flexible couplings to motor and oil pump; an oil-regulating cock to make close adjustments of the oil delivered to the burner; a Type L auxiliary unit, comprising a motor, belt-connected to a blower which is direct-connected to an oil pump; and a Type S auxiliary unit in which a turbo-compressor and motor are direct-connected, forming an integral unit. A diagram of a typical layout is shown, also a table of fuel-oil data. Sizes 6 x 9 in. Pp. 15.

UNITEM SUBMERGED WATER HEATERS are featured in a catalog issued by McDermott Water Heaters, Inc., Architects Building, 101 Park Ave., New York. The catalog treats of the installation of these heaters and presents impressive figures regarding the savings in fuel possible through their use, the adaptability of the heater to oil burners and some interesting notes on the way the heaters are rated. A number of views are shown of typical installations in connection with various types of boilers. Photographs are shown of prominent buildings, apartment houses and hotels which are equipped with this heater, accompanied by letters from satisfied owners, approving their operation. Size 8½ x 11. Pp. 16.

FRONT RANK FURNACES are presented in a well-illustrated catalog (No. 17) received from the Langenberg Mfg. Co., St. Louis. It is stated that the Front Rank steel furnace, because of its boiler-plate construction, is especially well qualified to withstand the strains imposed by the intermittent operation of automatically-controlled oil burners. Photographs of typical homes heated by Front Rank furnaces are included.



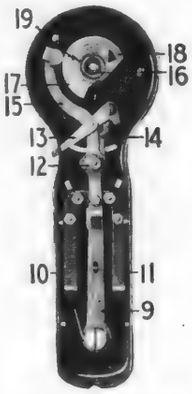
Cutaway Section of Main Drum of Front Rank Steel Furnace

Helpful data are given in the form of a table of heat-transmission constants for various types of wall construction, notes on chimney requirements and a summary of the causes of and remedies for the most frequently encountered defects in warm-air heating systems. The catalog features the Front Rank automatic air humidifier which is attached to the furnace. This device, which provides a constant supply of moisture, consists of a valve, a water-tight tank and a cast-in balance weight. It is stated that it may be attached to almost any water-pan. Size 8 x 10¾. Pp. 40.

For Your Home is the title of an interesting catalog published by L. R. Barber Mfg. Co., Inc., Fresno, Cal. The rates for electricity being low enough in many sections of this favored State, there has been developed by the Barber company a line of heating, cooling and humidifying equipment in which electricity is used throughout. To provide for those sections where gas is mainly used for house heating, similar equipment with gas heaters has been developed. Where such equipment is used, it is usually installed to provide for only one having a small group of rooms and is located immediately under the floor so that there is practically no duct work. Control is usually manual through a system of push buttons or it may be automatic. Complete equipment consists of a ventilating fan with air washer and a heating unit so installed that the air may be cooled during the summer and heated during the winter. The use of electricity for heating entire rooms on a large scale is responsible for an interesting heating unit in which the heat is produced in spiral resistance coils which are surrounded by metal fins in such way that the absorption of radiant heat from the heating coils is effectively secured. These metal fins are formed into ducts through which the air is passed, thus making for very effective heat transfer. These units are made in capacities from 6 to 15 K.W. In the large sections of the country where electricity for the safe heating of buildings is prohibited, it is interesting to note that installations as large as 190 K.W. have been made by this company. Size 7 x 10. Pp. 12.

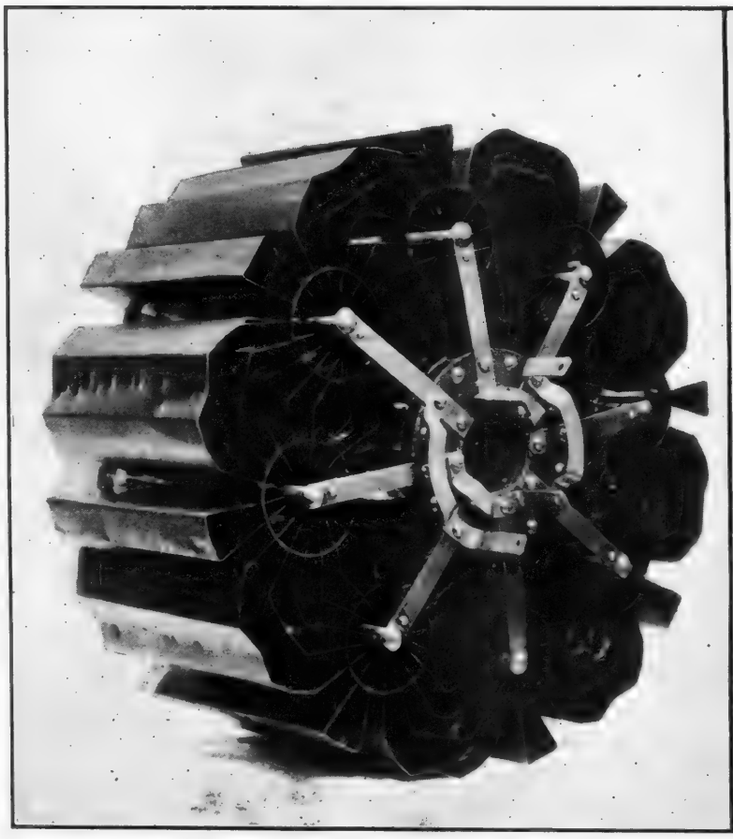
Detail of Cams, Honeywell Type R Thermostat

Installation and Service Manual of Honeywell Heating Specialties is published by Honeywell Specialties Co., Wabash, Indiana, to assist the oil burner manufacturer and dealer to better understand the principle and application of Honeywell controls. In the 42 pages of this manual a detailed technical description of each piece of Honeywell apparatus is given, with instructions for installing, adjusting and handling. Every possible trouble that might develop is listed, with the method of locating it and the remedy. There are many illustrations of detail parts and assemblies, and wiring diagrams of the various circuits are shown.

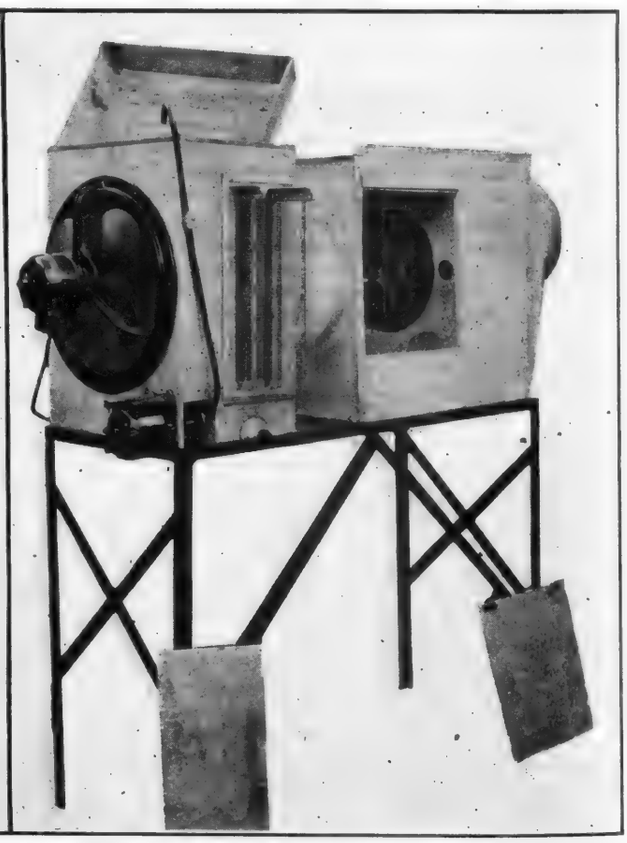


Interior View of Type R Thermostat

Of particular interest is the Type A Masterstat, which is designed for use with the intermittent type oil burner using a Honeywell motor switch. The Masterstat is intended to function as a dual control in conjunction with the room thermostat, and is available for



Spiral Resistance Coils Surrounded by Metal Fins, Used in Barber Electric Heated Units



Barber Electric Heated Unit Comprising Ventilating Fan and Air Washer

hot water, steam, vacuum, vapor and warm air. The DS and DSS motor switches are also described in detail, with the story of their functioning. The manual is 8½ in. x 11 in., in loose-leaf binder.

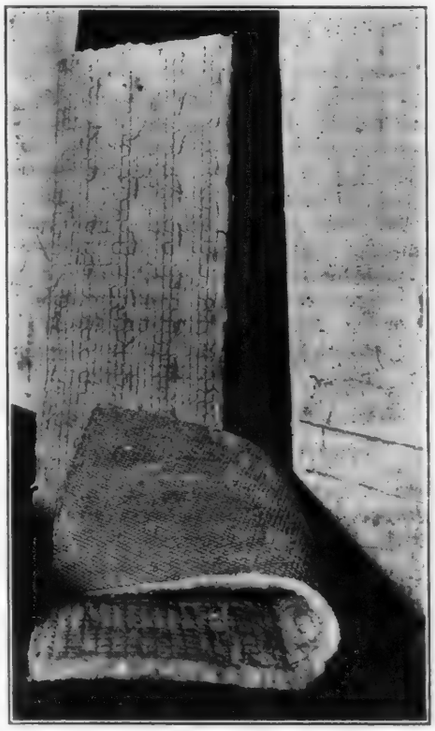
TUTTLE'S TITE-ON CEMENT, manufactured by Tuttle's Tite-On Cement Co., 4505 Ravenswood Ave., Chicago, is described in circulars issued by that company as a cement with a metal base which will adhere to any metal, including galvanized-iron, lead pipe, steel, aluminum and gray iron. It is stated further that it will stand high temperatures, city water pressure, steam pressure and vibration; and that it can also be used on wood, iron, slate, glass and porcelain. It is supplied in two colors, white for enamel fixtures and gray for steam appliances.

AUTOMATIC PUMPING is the title of a new booklet (400a) issued by Barrett, Haentjens & Co., Hazleton, Pa., made up of a paper by Otto Haentjens and W. A. Cather, read before the Lehigh Valley Section of the A. I. E. E., at Wilkes-Barre, Pa., March 26, 1926. Other bulletins issued by this company describe the automatic operation of centrifugal pumps, but the new manual differs from those previously published in treating the subject from a purely technical standpoint. Several new methods of making centrifugal pumps automatic are described. Size 8½ x 11 in. Pp. 12.

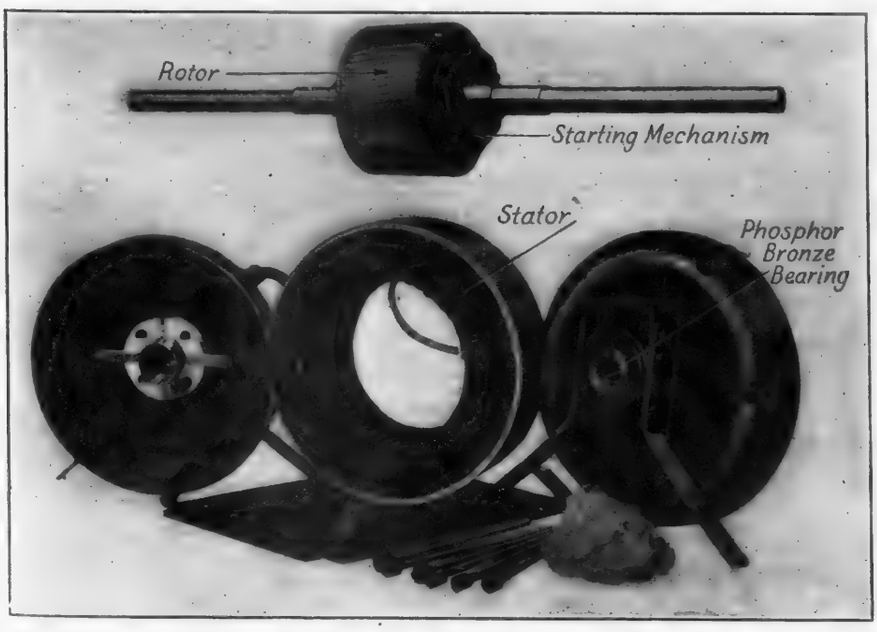
UNIVERSAL HEATING AND VENTILATING UNIT, featuring especially the quiet-operating single-phase alternating-current motor with which this unit ventilator is now equipped, is featured in a new Bulletin, No. 207 (A. I. A. File No. 30-D-11). The new Universal single-phase motor, it is stated, in conjunction with the three-point lead-mounting feature, makes it possible to supply Universal units equipped with quiet-operating motors for any character of current. At the same time, wherever polyphase current is available, the manufacturer recommends that it be used. Complete electrical data on single-phase motors are included in the bulletin which forms a supplement to Bulletin 205. There is also a typical wiring diagram and a typical electric specification. Size 8½ x 11 in. Pp. 12.

TRANE HEAT CABINETS ARE DESCRIBED in a catalog in colors (A.I.A. File No. 30 c 4) received from the Trane Co., LaCrosse, Wis. These units, which are designed to take the place of radiators, are essentially steam- or water-heating elements enclosed in a cabinet which acts as a flue. Air is drawn by gravity through the open base of the unit, passed through the Trane heater and exhausted into the room through a grill at the top. The amount of warm air supplied is regulated by a damper which is located in the cabinet above the heating element. This element is composed of a series of vertical copper strips fastened to a U-pipe through which the steam or hot water passes. The heat cabinet is designed as a piece of furniture and can be supplied to match its surroundings; or, if it is desired, the unit may be concealed. The catalog contains tables of dimensions and capacities of heaters, and drawings and data for the arrangement and sizes of connections. Heat tables and suggested specifications are also given. Size 8½ x 10¾. Pp. 24. (punched for binding).

HEAT INSULATIONS tells the story of the products of the General Insulating and Manufacturing Co., Alexandria, Ind. These products consist of brick, designed to withstand temperatures of 2400° F., blocks made up in slabs 18 x 24 in. in any thickness from 1 to 4 in. designed for 2000° F. maximum temperature; pipe covering, designed for the same extreme; flexible lagging, in which the insulating material is felted and compressed between sheets of metal netting capable of withstanding a temperature of 1400° F., and cement that will not disintegrate at 2590° F. The raw material from which these products are made is a calcium-silicate rock found in a single isolated deposit. This base material is melted at approximately 3000° F. and blown in to a peculiar long-fibred mineral wool known as rock wool. This was first made nearly thirty years ago and should not be confounded with mineral wool made from blast furnace slag. Gimco products are chemically stable and will not disintegrate with age. They contain no sulphur. The development of methods of manufacture in handling this material forms an interesting chapter in American industrial achievements. The catalog contains much interesting information on the subject of insulation, full details of specialties manufactured by this company, and price list.



Gimco Insulation Made Up as Flexible Lagging



Exploded View of Universal Brushless Single Phase A. C. Motor Showing Screw-Wound Rotor

THE "SAFETY FIRST" HEATER for heating garages, filling stations, offices and small homes, in which the fuel used is kerosene or an oil distillate, has been brought out by the Gloria Light Co., 112-118 North Main St., Chicago. It is made in two sizes, one burning 5 to 6 hrs. on a gallon of oil and the other 3½ to 4½ hrs. on a gallon of oil. The heater is provided with an automatic shut-off, so that, if by any chance the flame should go out, the shut-off will automatically cut off the supply of oil. The equipment includes an oil supply tank and air pressure pump, the tank being of 10 gal. capacity.

Buffalo for Next Oil Burner Convention

At a quarterly meeting of the directors of the American Oil Burner Association held at the King Edward Hotel, Toronto, Ontario, July 12, it was decided to hold the next annual convention in Buffalo, on April 5, 6 and 7, 1927.

The plans for an organized publicity campaign, to be carried out largely through the mails, as formulated at the last annual convention, have progressed to such a stage that the directors authorized the initiation of the movement.

Meeting of Chicago Oil Burner Association

More than thirty oil-burner dealers, salesmen, engineers, oil distributors and storage-tank manufacturers were present at the monthly meeting and dinner of the Chicago Oil Burner Association, July 13.

Homer R. Linn, chief engineer of the western executive office of the American Radiator Company, Chicago, who was the chief speaker of the evening, gave an encouraging talk on oil and oil burners.

Crosley Enters Oil-Burner Field

Announcement is made by the Crosley Radio Corporation, Cincinnati, O., of the Crosley oil burner, which is of the automatic type and of remarkable simplicity of design. An oil-burner division of the company has been organized to market the burner which will retail at $300.00.

Powell Crosley, Jr., head of the Crosley Radio Corporation, is well known through his radio achievements, particularly in the standardization of manufacturing details. The new burner was designed by one of the company's engineers, J. H. Stewart. It has but two moving parts, the motor shafts. Other notable features of the burner are its ignition from electric arc, self-priming centrifugal pump, Crosley clarifier for radios and master switch (time limit).

The burner is made up in two factory-assembled and tested units, enclosed in metal housings.

PROTECTION FOR THE USER OF FUEL OIL is the caption of a folder distributed by the Chicago Boiler Co., 1967 Clybourn Ave., Chicago, introducing a new tank designed to meet the new method of refueling under pressure. This tank is constructed with the intention of eliminating the possibility of serious tank rupture while being filled under pressure. Standard sizes of tanks are supplied from stock, and the company is equipped for prompt delivery on special sizes to the purchaser's specifications. The guarantee states that the new "C B" fuel-oil tanks are tested to 20 lbs. pressure and are guaranteed tight when properly installed and used.

Servicing Oil Burners with Simple Forms

IN collecting data on current practice in servicing domestic oil burners, it has been interesting to note the wide variation in practice, both with reference to the policies adopted and the forms used for service reports.

One manufacturer, building a burner that appears, from an analysis of service reports, to be practically immune from trouble, has prepared for distribution to its dealers the most elaborate printed form imaginable, having spaces for recording every ailment of which the burner might be guilty. The purpose of this elaborate form is to make sure, from the start, that every chronic or inherent ill of the burner is corrected at the earliest possible moment, and this can only be done by using some such method of quickly and accurately reporting each trouble on burners scattered all over the country.

On the other hand, it is not necessary to resort to such elaboration or even to printed forms in order to provide proper service, as is evidenced by the story of a dealer in a New England city of 15,000 population, where this dealer has 58 burners in operation. The burners are of a well-known make, representative, perhaps, of the best that the present market affords. Twelve of the burners

Oil Burner Inspection Sheet

Date_____

Name_____ Oil Burner Installation No._____

Address_____

ELECTRICITY —
D. C. - A.C._____ Voltage_____ Order No._____ Cycles _____

BOILER —
Steam - Hot Water - Vapor - Hot Air_____

Make of furnace or boiler_____

Number_____ Capacity_____ Sq. Ft. Grate Area___

Round or sectional_____ Is boiler covered?___

Remarks concerning boiler_____

_____

Radiation - See radiation sheet attached_____

PIPES
Are pipes covered?_____ Remarks concerning Piping _____

_____

CHIMNEY -
Size of flue_____ Height_____

Any other connections_____

Is there an offset in chimney?_____

Remarks concerning chimney_____

INFORMATION -
Are all rooms heated?_____ How many heated?_____

How many not heated?_____ Are any rooms hard to heat?___

Which rooms?_____

If steam; what kind of air valves are used?_____

Could 70° be maintained last winter in zero weather?_____

If so, what temperature of water or pressure of steam?_____

Kind of coal burned_____ Tons used last year_____

Tons used a year ago_____ Tons used two years ago_____

Above Information O. K.

_____ Salesman

_____ Owner

Oil-Burner Survey Sheet Used in Selling Oil Burners

Free Service
and
Inspection Sheet

Name_____ Address_____ Date_____

Burner No._____

Customer's Report_____

_____

_____

Inspection of:	Results and corrections
Thermostat	
Plastering	
Firebox	
Director	
Spark Plug	
Nozzle	
Pump	
Leaks	
Control Box	
Spark Coil	
Pressure	
Air Control	
Chimney Smoke	
Safety Pan	

Remarks_____

_____

_____

Time_____

Material used_____ Inspector_____

_____

_____

Oil-Burner Inspection Sheet Used in Servicing Burners

have been in service through three heating seasons, 32 through two, and 14 have just completed their first season.

Service was required through eight months, November and December requiring the largest number of calls, 40% of the total. The average number of calls was 3. In classifying the cause of service, it was found that 20% represented the replacement of fuses, which number, with a little more familiarity on the part of the owner, should be eliminated. Electrical troubles, aside from blown fuses, caused 40% of the calls, and the same number were charged to mechanical troubles, chiefly associated with the oil pumping equipment. Perhaps this last was influenced by the climatic conditions, as the weather is extreme in this location.

Mimeograph forms are used for all records from the sale of the burner, through the installation, and for the service that may be later rendered. Free service is limited to 90 days, after which a charge is made at a reasonable hourly rate. It is in the use of these cheap and simple forms that this representative has shown his initiative, and the reports of the burner owners in his city show that every effort is made to render the most responsive service under the adverse conditions that frequently face the trouble man in that climate.

Organization of Unit Heater Association

In connection with a report published in THE HEATING AND VENTILATING MAGAZINE for June, announcing the organization of the unit heater manufacturers, it should be said that the secretary and treasurer of the association is E. E. Cresap. Mr. Cresap is also secretary of the National Association of Fan Manufacturers. The other officers, as announced in the June issue, are: President, Thornton Lewis, of the York Heating and Ventilation Corp., Philadelphia; vice-president, H. S. Wheller of the L. J. Wing Mfg. Co., New York.

It is the purpose of the new organization to standardize engineering principles with regard to rating of unit heaters, as well as with regard to tests, and the issuing of data covering such tests. It will be the intention of the association to prevent, as far as possible, the publication of any incorrect information on this type of heater.

New Publications

LIMITING FACTORS IN REDUCING EXCESS AIR IN BOILER FURNACES is the title of an article by E. G. Bailey, president of the Bailey Meter Co., Cleveland, O., reprinted from *Mechanical Engineering* for July, 1926. The paper was presented originally at a meeting of the Metropolitan section of the A.S.M.E. in New York, April 8, 1926. It is a study of the interrelationship and the relative importance of the three factors most closely related to excess air; namely, furnace temperature, unburned fuel, and heat losses in chimney gases.

Rapid changes and developments have been made in the last ten years in the preparation of both solid and liquid fuels, and in the mechanical devices for handling these fuels at the furnace. During this time, Mr. Bailey has been closely in touch with the field in the capacity of supervisor of the installation of about 4000 boiler meters recording the steam output, the air flow and, in most cases, the flue-gas temperatures. Data thus obtained, when classified and averaged for different fuels and different types of fuel burning equipment, have a value in that they represent definite tendencies and relative characteristics. The data presented in this paper are taken from more than 75,000 complete flue-gas analyses. Size 9 x 12. Pp. 7.

A SHORTAGE OF SKILLED WORKMEN will continue unless there is a more concerted effort on the part of employers to train apprentices, is the warning given in a pamphlet on "Apprenticeship," just issued by the Department of Manufacture of the Chamber of Commerce of the United States. The pamphlet is based on a nation-wide investigation and contains useful information concerning methods of training now used in industries and vocational schools. The purpose of the pamphlet is to awaken employers to the need for training skilled workmen to meet the growing needs of industry. Restricted immigration and the tendency for boys to go into clerical and office work, says the pamphlet, is the cause of the shortage of trained men. It is pointed out that the belief that only large concerns can afford to train apprentices is not justified by fact; that many small companies as well as large ones are training apprentices.

Present Accepted Practice in Domestic Oil Burners

21. Johnson. *Rotating Cup, Atomizing, Mechanical Draft, Gas Ignition*

Previous articles in this series are:

1. *Kleen Heet, July*, 1925.
2. *Baker, July*, 1925.
3. *Kerrihard, July*, 1925.
4. *Silent Glow, August*, 1925.
5. *Aetna, August*, 1925.
6. *Caloroil, September*, 1925.
7. *Oil-O-Matic, September*, 1925.
8. *Chalmers, October*, 1925.
9. *Hart, October*, 1925.
10. *Sun, October*, 1925.
11. *Rayfield, November*, 1925.
12. *A. B. C., November*, 1925.
13. *Electrol, December*, 1925.
14. *Grant, January*, 1926.
15. *Nu-Way, January*, 1926.
16. *Wayne, February*, 1926.
17. *May, February*, 1926.
18. *Ray Rotary, March*, 1926.
19. *Super Oil Heator, May*, 1926.
20. *Nokol, July*, 1926.

21. Johnson

THE Johnson rotary oil burner is one of the few on the market today that has a background of over a decade of successful use. It is manufactured by the S. T. Johnson Co., Oakland, Cal., and has been built and sold on the Pacific coast for nearly twenty-two years.

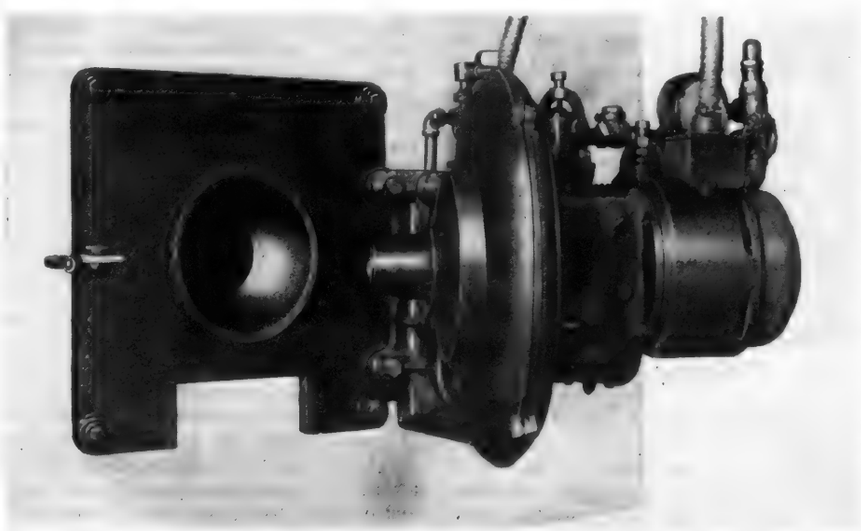
Naturally, the burner was first developed and used as a manually-operated burner, and, long before the days of automatic operation, or of "listing" of burners by the Underwriters, the smaller sizes of the Johnson burner were used in thousands of western homes; even to-day there are unnumbered owners of these burners who are entirely satisfied to continue the use of these "old-time" burners, rather than to assume the complexities of the full-automatic.

The Johnson burner is built in five sizes, having maximum hourly capacities of 15 lbs., 50 lbs., 125 lbs., 250 lbs. and 500 lbs. of oil. The minimum capacities vary from 8 lbs. in the smallest size to 100 lbs. in the largest. These capacities correspond with steam boiler ratings of 600 sq. ft. to 20,000 sq. ft. Each size is built either for manual or automatic control.

A HORIZONTAL ROTARY TYPE

All of these sizes are substantially identical in design, and all are of the horizontal motor-driven rotary-cup atomizing type. The burner unit consists of a front-plate, designed to be bolted to the ash-pit door-frame, to which the motor-fan assembly is hinged. This construction permits the burner to be swung into position, or out, for inspection, oil being taken from the storage tank through one hinge, the surplus being returned to the tank through the other.

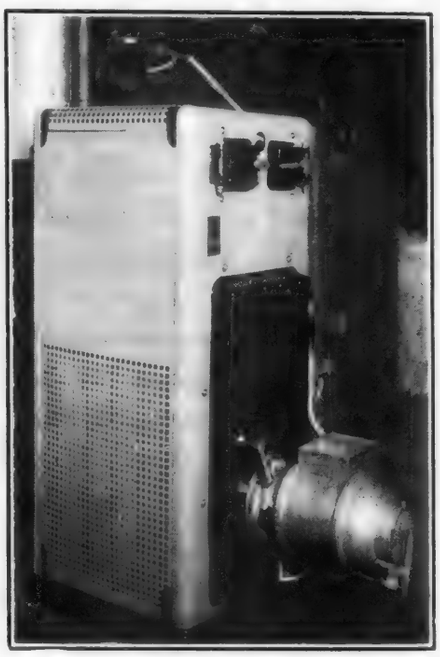
When the burner is in the firing position, the blower fan is immediately in front of the front-plate, and surrounds the nozzle. The main motor-bearing is between the fan and the rotor of the motor, with a steady bearing at the inboard end of the motor. This design balances the fan weight against the rotor weight, and insures smooth running and minimum bearing wear. The oil pump, driven by a worm-gear, is between the fan and the motor.



Johnson Burner Swung Open for Inspection

The motors are designed for 3450 r.p.m., and are supplied for A.C. or D.C. current where manual operation is desired, but the automatic burners are available with either 110 v. or 220 v. 60 cycle alternating current motors. The atomizing cup is attached to the inboard end of the motor shaft, and oil is fed to it through a pipe from the oil pump.

Air from the fan enters the combustion chamber in an annular cone surrounding the cone of atomized oil, and the gasified oil, by the heat of combustion, is intimately mixed with the air to the degree necessary for proper combustion. Means are provided for changing the amount of air provided, and also for changing the angle of the air cone,



Small Johnson Burner Fitted to Arcola

making it possible to secure a long or a short flame, to best suit the type of boiler in which the burner may be installed.

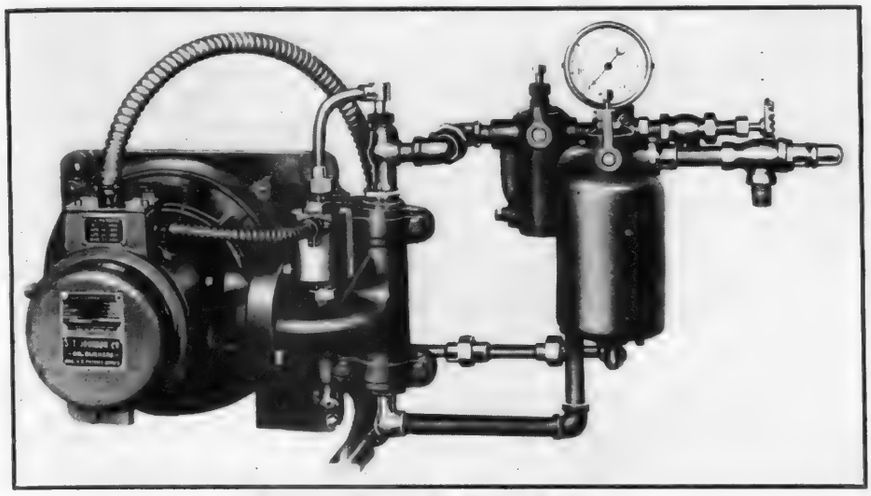
OIL LINE GUARDED BY MAGNETIC CUT-OFF

Oil is taken by the worm-gear driven pump, through a large strainer, and through one of the hinge-ports; then through a magnetic oil-valve, the coil of which is so connected in the motor circuit that the oil valve is open only when the motor is running. The pressure of oil to the burner is controlled through an adjustable relief valve, which allows the unwanted oil to be returned, through the other hinge-port, to the tank. The burners are designed for operation with any proper oil from 28° A.P.I. to 38° A.P.I.

There is only one point to lubricate; the worm-gear and the main motor bearings; these are lubricated from the same oil-well. Attention to this is required about every two weeks.

THE ELECTRICAL CONTROL CIRCUITS

A distinctive control circuit includes a master-switch, located on the base-



Johnson Burner in Firing Position

ment wall, a control thermostat, located in any desirable room, a boiler or furnace safety control, a stack switch, or combustion control and a magnetic oil shut-off valve. With the system in the normal "off" position, when the control thermostat calls for heat, the closing of the thermostat circuit operates through the master-switch to close the motor circuit, and at the same time energizes the oil valve coil, admitting oil to the atomizing cup, and energizes the gas-pilot expanding device, so that the gas flame is enlarged from 1 in. in length to about 5 in. If ignition is accomplished in the normal way, the gas-expander is shunted out in about 15 seconds, through the functioning of the stack safety device. The current is also, by the same action, shunted out of a heating coil in a temperature relay, and the burner functions to develop the necessary quantity of heat for the building.

When the predetermined room temperature is reached, the thermostat opens the control circuit, the master switch opening the motor circuit, de-energizing the oil valve, and the burner ceases functioning. In case of the development of excessive heat at the boiler, while the thermostat continues to call for heat, as might happen if the windows in the control room were left open, the boiler or furnace safety operates to break the thermostat circuit, as it is in series with it, and the burner is shut down.

When both the thermostat and the boiler safety have come to the closed position, the burner starts, going through the starting cycle as outlined.

In case of failure of ignition, due to any cause, when the room thermostat calls for heat, the motor will start, but the failure of the stack safety to operate (due to absence of hot stack gases) will cause the current to flow through the heating element of the temperature relay, and the relay will open the main motor circuit, shutting off the motor. It is then necessary to push a "re-set" button on the master switch, to enable the burner to go through the starting cycle.

This circuit, it will be noticed, eliminates any series coils in the main motor circuit, and it is claimed that this prevents much trouble in sections where the voltage is not well maintained on the lines. The introduction of any coil or other device producing a voltage drop, in series with the motor, tends to lower the effective voltage available for starting, and trouble from this cause, in the past, has resulted in this circuit.

"BRICKING-IN" OF COMBUSTION CHAMBER

Although the Johnson burner can be started from "cold" in an open room, without smoking or throwing un-gasified oil, it is recommended that the ash-pit or fire-box be surrounded with refractory brick or material, to secure the most efficient combustion. Twenty years of experience has developed very definite methods of "bricking-in" boilers and furnaces of various types, and the Johnson organization is provided with plans and specifications for this work in practically every size and type of boiler. With the proper bricking, and the ability to control the flame shape and size, it is possible to adapt the burner to anything from a small round boiler, or an "Arcola" to a large rectangular sectional, or a steel boiler, with a long fire-box.

One of the most impressive documents in the oil-burner industry is the Johnson portfolio, filled with half-tone pictures of buildings in which Johnson burners have been in operation, many from ten to fifteen years.

The "Type 26-A" Johnson burner is listed by the Underwriters, for use with oil fuel not heavier than 28° A.P.I., with automatic control for domestic and commercial uses.

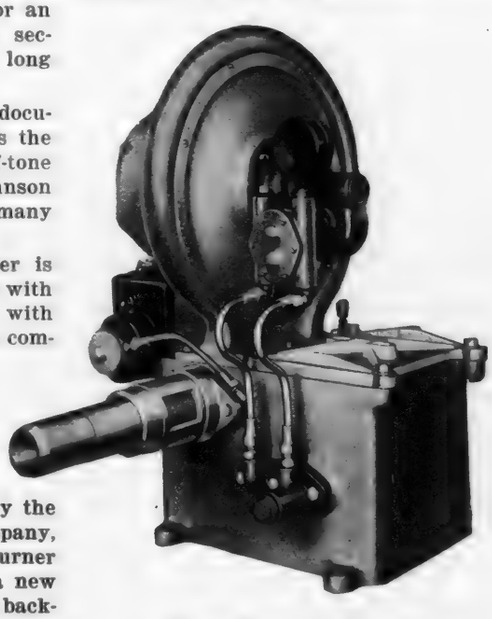
Petro Domestic Oil Burner

Announcement has been made by the Petroleum Heat and Power Company, New York, N. Y., of the Petro oil burner for domestic use. While this is a new burner in name, it has behind it a background that is unique. It is the product of a company that has been manufacturing industrial burners for many years, installing them in some of the most noteworthy buildings in the world and furnishing the fuel for them. It is interesting to see how the basic principles of the industrial burner have been retained in the domestic burner, which also incorporates the traits essential to use in a residence. The "daddy" of the Petro is M. A. Fesler, who has been engaged in designing and building oil burners for so long that it is difficult to find one who antedates him. In creating the new burner, Mr. Fesler has utilized only principles that have stood the test of time. A fascinating solution of the noise problem has resulted in a fan that practically cannot be heard when in operation. A new departure in the design of the motor provides for an entirely enclosed unit, practically air-tight. Air for the fan is drawn over the surface of the motor shell. Thus cooling is effected, but no dirt or dust in the air can enter the motor.

The burner is of the revolving-cup atomizing type, the cup being driven by the blast of air from the fan. Honeywell controls are used, with fifteen-day clock thermostat.

An indication of the organization back of the Petro burner may be gained from the statement that over 1500 large buildings in New England alone are equipped and served by this company. These installations include Harvard University, Boston City Hospital, the Equitable and Metropolitan buildings in New York, the New York Municipal Building, John Wanamaker Stores, Ritz-Carlton Hotel, in New York and Brown University in Providence, R. I. In 1925 the company delivered over $100,000,000 gallons of oil to customers using Petro industrial burners.

Nearly a hundred Petro domestic burners have been in use for one or two heating seasons in and near Stamford, Conn., where the factory is located, and, the final design having been determined, the factory is now in production.



Petro Domestic Burner

Large-scale Industries the Most Efficient

Manufacturing plants having an annual output of one million dollars or more are by far the most efficient in the utilization of labor, according to an analytical study of comparative productivity in plants of various sizes, made by the National Industrial Conference Board, 247 Park Ave., New York. The investigation revealed further that, during the period of 1919-1923, medium-sized plants, particularly those with an annual output of from $20,000 to $500,000 had made more rapid gains in labor utilization efficiency than the groups of either the larger or smaller plants.

Skidmore Pump Not an Infringement

A decision handed down by the United States Circuit Court of Appeals for the First Circuit, dated July 2, 1926, upholds the decision of the District Court for the District of Massachusetts, in the case of the Nash Engineering Company, plaintiffs, vs. William D. Cashin et al. defendants. The Federal District Court's decision, which has now been upheld in the higher court was to the effect that "the Jennings' reissue patent for a vacuum steam-heating system is valid, but not infringed by the defendant." The defendants, W. D. Cashin & Company, it should be stated, are the New England representatives for the Skidmore Corporation, of Chicago, so that the court's decision refers to the Skidmore hydro-turbine vacuum and boiler-feed pump.

The question before the court turned on whether the Jennings patent was broad enough to cover a wet vacuum pumping apparatus like the Skidmore pump.

The appellate court holds that the Skidmore pump is a different device, not merely in appearance, but in method of operation, from the Nash pump.

FOXBORO INDICATING DIAL-TYPE THERMOMETERS are described in a four-page folder issued by the Foxboro Co., Inc., Foxboro, Mass. The operation of this instrument, which is of the long-distance type, depends upon the vapor pressure of a volatile liquid or the direct expansion of an inert gas. The movement consists of a single Bourdon tube and a rack and pinion device that multiplies the motion of the tube, transforms it into a rotary motion and transmits it to the pointer. This company furnishes also bottom and back-stem types for immediate application to closed vats, tanks and other containers.

Oil Burners Approved by New York City Board of Standards and Appeals As of July 1, 1926.

NAME OF BURNER	FILED BY
Steam Oil Burner	Petroleum Heat & Power Co., 511 Fifth Ave., New York.
Fess Turbine Burner	Petroleum Heat & Power Co., 511 Fifth Ave., New York.
*Richmond Gravity Fuel Oil Burner	John C. Quinn, 28 Fort Pl., St. George, S. I.
*Williams Oil-o-matic Fuel Oil Burner	Fuel Oil Burner Corp., 101 Park Ave., New York.
Babcock & Wilcox Mechanical Oil Burner	Babcock & Wilcox Co., 85 Liberty St., New York.
Hammel Oil Burner	Hammel Oil Burning Co., 1480 Broadway, New York.
Best Calorex Burner	W. N. Best Furnace & Burner Co., 11 Broadway, New York.
*Johnson Improved Rotary Fuel Oil Burner	Fuel Oil Burner Corp., 101 Park Ave., New York.
Lientz Oil Burner	B. P. Lientz Oil Furnace Corp., 291 Broadway, New York.
Rohr Schanch Fuel Oil Burner	Gilbert & Ashfield, 350 Fulton St., Brooklyn.
Peabody-Fisher Wide Range Mechanical Oil Burner	Peabody Engineering Co., 331 Madison Ave., New York.
Todd Mechanical Fuel Oil Burner	Todd Oil Burner & Eng. Co., 742 East 12th St., New York.
Anthony Nebulyte Oil Burner	The Anthony Company, 138 West Ave., Long Island City.
Aetna Automatic Oil Burner	Aetna Automatic Oil Burner Corp., 27-31 Pine St., Providence, R. I.
Simplex Horizontal Rotary Fuel Oil Burner	Geo. Getzoff, 50 Church St., New York.
Rockwell Fuel Oil Burner	Rockwell Company, 50 Church St., New York.
Ballard Low Pressure Mechanical Oil Burner	Ballard Oil Burning Equipment Co., 142 Pearl St., New York.
Bayard Domestic Fuel Oil Burner	R. Gordon Mackay, 16 Court St., Brooklyn.
Ballard Duplex Electric Driven Pump	Ballard Oil Burning Equipment Co., 142 Pearl St., New York.
Coen Mechanical Oil Burner	Coen Company, 50 Church St., New York.
Ballard Staples & Pfeiffer Steam Atomizing High Pressure Burner	Ballard Oil Burning Equipment Co., 142 Pearl St., New York.
*Schulse Home Oil Burner	Schulse Engineering & Supply Co., 20-22 Fourth Ave., Brooklyn.
Viking Pump	B. F. Schirmer Co., 342 Madison Ave., New York.
*Baker Automatic House Heating Burner	Baker Steam Products Co., 1926 Broadway, New York.
*Kleen Heet Oil Burner	Winslow Boiler & Engineering Co., 50 East 42nd St., Manhattan.
McGowan Fuel Oil Burning and Heating Set	Chas. F. Ames & Co., Ltd., 90 West St., Manhattan.
*Espo Oil Gas Burner	Thos. O. Esposito, 1982 E. 15th St., Brooklyn, New York.
Induslo Fuel Oil Burner 1-27	Oil Burning Equipment Co., 50 Church St., New York.
Quinn Oil Burning Equipment	William R. Quinn Combustion Engineering Co., Broad St., New York.
Dahl Oil Burner	Bethlehem Shipbuilding Corp., Ltd., Bethlehem, Pa.
Ray Rotary Fuel Oil Burner	Preferred Utilities Co., Broadway & 57th St., (Fisk Bldg.) Manhattan.
Ballard Automatic Oil Burner	Ballard Oil Equipment Co., 120 Broadway, Manhattan.
Enco Burner	The Engineering Company, 17 Battery Place, Manhattan.
*Universal Fuel Oil Burner	Saul J. Berger, 51 Chambers St., Manhattan.
*Caloroil Burner Type AA	Caloroil Burner Corp., 5 East 40th St., Manhattan.
*Gill Oil Burner	Tracy Lyon, 347 Madison Ave., Manhattan.
*May Oil Burner	May Oil Burner Corp., 8 Hicks Place, Flushing, L. I.
Morse Fuel Oil Burner	Morse Dry Dock & Repair Co., Foot of 54th St., Brooklyn.
*Nokol Automatic Heater	Cornell Utilities Co., Inc., 130 Park Ave., Manhattan.
*Powerlight Oilheat Burner	Powerlight, Inc., 7 East 14th St., Manhattan.
Todd Steam Atomizing Fuel Oil Burner	Todd Oil Burner & Engineering Corp., 742 East 12th St., Manhattan.
Todd Rotary Fuel Oil Burner	Todd Oil Burner & Engineering Corp., 742 East 12th St., Manhattan.
*International Oil Burner	J. F. Niebuhr, 2506 Gilmore St., Elmhurst, N. Y.
*Faultless Oil Burner	Alfred R. Hause, 137 Corona Ave., Corona, N. Y.
Socony Arrow Oil Burner Pump and Fan Set	Socony Burner Corp., 26 Broadway, Manhattan.
*Wayne Oil Burner and Pump, Type N & A	Wayne Tank and Pump Co., 1780 Broadway, Manhattan.
Tate Jones Fuel Oil Burner L Type	Tate Jones Co., 50 Church St., Manhattan.
Petro Mechanical Burner and Air Register	Petroleum Heat & Power Co., 1775 Broadway, Manhattan.
Gilbert & Barker Oil Burner and Pump	Gilbert & Barker Mfg. Co., Springfield, Mass.
*Ballard Super Domestic Oil Burner	Ballard Oil Equipment Co., Inc., 120 Broadway, New York.
*A. B. C. Oil Burner	Par-X-Oil Burner Corp., 26 Court St., B'klyn.
*Hardinge Oil Burner and Pump	Hardinge Bros., Inc., 250 Park Ave., New York.
*K. F. C. Oil Burner	William F. Regan, Esq., 45 Willoughby St., Brooklyn.
Surface Combustion Low Pressure Burner	Surface Combustion Co., 366-68 Gerad Ave., Bronx, N. Y.
Electrol Automatic Oil Burner	Henry Schoenherr, Esq., 63 Wall St., New York.
Moussette Oil Burner	O. J. Moussette Co., 8637 111 St., Richmond Hill, Queens.
Melco Automatic Oil Burner Type A	Melco Engineering Corp., 280 Broadway, New York.
Paramount Oil Burner	Paramount Fuel Oil Burner Co., Bayside, Long Island, N. Y.

*Mainly used in domestic installation.

Remote Control of Temperature

That none of the steam generated for heat should be sent to parts of the building where it is not needed, in the Bell Building, Chicago, a Pneumatic Switchboard for remote control of risers was installed.

By this means the engineer is enabled to control the heat to the best advantage. If a strong wind off the lake, for instance, calls for plenty of heat to be supplied to the east side of the building, the engineer throws the pneumatic switches controlling the risers on that side, opening those valves. At the same time air currents in the building may carry so much of that heat to other parts of the building that no heat supply will be required there. Therefore the engineer, through the Pneumatic Switchboard, closes the valves in certain other risers, thus conserving his steam, and consequently saving fuel.

How It Works

Each switch on the Board is numbered, the numbers corresponding to those on the diagram of piping around the front of the Board showing the riser valves.

This diagram approximates the ground plan of the building, which covers 65x130 feet of ground, so the engineer easily controls the supply of heat to the several sections of the building without leaving the engine room, and can send steam to the one or more portions needing it, without wasting any in those parts that do not require it.

This saves not only fuel but time and labor as well, and gives prompt service to the tenants.

Other Applications

This pneumatic control handles dampers and valves that would otherwise be almost or completely inaccessible.

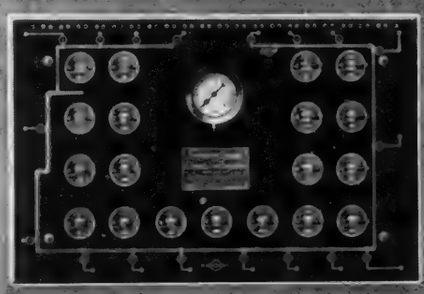
A ventilating system frequently comprises means of bringing in fresh air, exhausting used air, and also ducts and equipment which permit of recirculating the air within the building, under certain conditions. This calls for large dampers, usually of the louvre type—and these are often of varying sizes and very distant from each other. By the use of the Powers Pneumatic Switch the entire operation of these dampers can be localized on a switchboard placed conveniently in the engine room.

Send for This Book

The Powers Pneumatic Switch is of very sturdy construction, and can be relied upon to remain tight, and to function, indefinitely.

Upon request we shall be glad to send a copy of our book "The Elimination of Heat Waste," which tells more about this detail of the Powers System and gives further information regarding other types of Powers Control.

BELL BUILDING—CHICAGO
Architects: K. M. VITZTHUM
J. J. BURNS
Consulting Engineer: MARTIN C. SCHWAB
Heating Contractors: MEHRING & HANSON



PNEUMATIC SWITCHBOARD
For remote control of risers, as installed in the Bell Building.
John C. Erickson, Building Engineer, here controls supply of steam to all risers in the building.

THE POWERS REGULATOR COMPANY

35 years of specialization in temperature control

2718 Greenview Ave., Chicago

Atlanta	Charlotte, N. C.	Detroit	Los Angeles	New York	San Francisco	Seattle
Baltimore	Cincinnati	El Paso	Milwaukee	Philadelphia	CANADIAN OFFICES	
Boston	Cleveland	Houston	Minneapolis	Pittsburgh	Toronto	Winnipeg
Buffalo	Denver	Indianapolis	Nashville	Rochester	Montreal	Calgary
Butte, Mont.	Des Moines	Kansas City	New Orleans	St. Louis	Halifax	Vancouver

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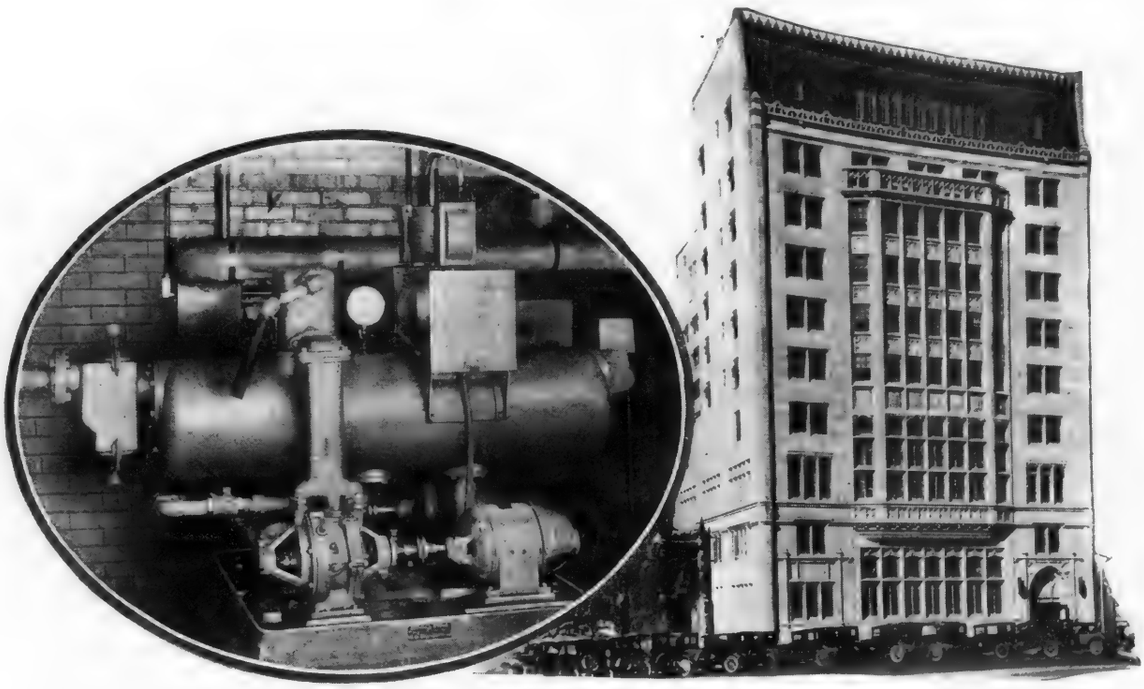


Where good service is paramount

Here is the Jennings Vacuum Pump, installed in the Columbia Club at Indianapolis. It is a loyal member of the club—ever true to its duty. Faithful—in that it stays everlastingly on the job of removing, whenever necessary, the condensate and air from the return line heating system.

In this it is like thousands of other Jennings Pumps now in use. They are dependable—unfailingly so. A Jennings Pump cannot be otherwise. Into it are built Jennings experience, Jennings design, Jennings workmanship, qualities which make reliable heating pump performance a certainty.

Let your next heating pump be a Jennings. It will serve you well.

ABOVE: A view of the Columbia Club Indianapolis, Ind.

OVAL AT LEFT: The Jennings Heating Pump installed on the Columbia Club vacuum steam heating system.

Note that the unit is of the duplex type and designed for continuous operation.

NASH ENGINEERING COMPANY
SOUTH NORWALK CONNECTICUT

Branch Sales Offices: Atlanta, Birmingham, Boston, Buffalo, Chattanooga, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Kansas City, Memphis, Miami, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Tampa, Washington, D. C. *In Canada*: Montreal, Toronto and Vancouver. *European Offices*: London, England, Norman Engineering Co.; Brussels, Belgium and Amsterdam, Holland, Louis Reijners & Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Pumps

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

2144-38

Trade and Miscellaneous Notes

Has the Peak Been Reached in School Construction?

School construction has been on the increase since the close of the war, according to the *School Board Journal* for July. With but one slight decrease in volume of construction, new schoolhouses have been erected with a degree of regularity that accords with the ever-growing increase in high school and college enrollments, and in the general interest in education. High school buildings in this country have been described by foreigners as palaces. At the same time grade schools have not been neglected.

Bond sales, if figures from that source may be cited as affording a reliable forecast of schoolhouse construction, indicate that the peak year was 1925. The excessive activity of that year, however, may have been caused by the materialization in the larger cities of plans that were contemplated and deferred in previous years, the article points out. New York is less active in school building this year than in 1925. California and Florida show an increase over former years. But the country as a whole does not show an activity equal to that of last year.

Oil-O-Matic Delegates Hold Enthusiastic Convention

A series of lively and instructive meetings are reported in the *Oil-O-Matic News* as constituting the business sessions of the Oil-O-Matic annual convention at Bloomington, Ill., June 21-22. The convention hall and the display rooms are located in the plant of the Williams Oil-O-Matic Heating Corporation. Fifteen hundred delegates, including a number of foreign representatives, attended.

The opening speech was made by C. U. Williams, president of the Williams Oil-O-Matic Heating Corporation, in which he outlined the physical development of the company since inaugurating its building campaign fifteen months ago. Mr. Williams then told of the plans that were being made for its future growth.

Walter W. Williams gave a talk on the ability of the company to produce burners, telling also of its research laboratory, where development work is being done.

A talk stressing the need of a definite sales plan, and insisting on this line of action as a requisite to good salesmanship was given by Grover C. Pledger.

Lawrence L. Smith, general sales manager, who followed, explained the plan of selling practiced by the company, pointing out the separate elements that make up the selling program.

Leroy Kling of the Kling-Gibson Co., Chicago, outlined the increase in national advertising and described the plan of telling the Oil-O-Matic story. He pointed out that this did not take the place of a salesman, but that both national and local advertising acquainted the prospective purchaser with the product.

Homer Buckley of Buckley, Dement & Company, Chicago, explained direct-mail methods and spoke highly of the new 18-piece direct-mail set, as opening the way for the salesman.

Amplifying Mr. Pledger's demand for planned intelligent methods, David Rosenblum, president of the Business Training Corporation of New York, held the audience for two hours, showing them the value of the course in Oil-O-Matic salesmanship. He made an analysis of the plan of Oil-O-Matic salesmanship; pointing out methods that contributed to success and those responsible for failure.

Oil-O-Matic advertising and selling

The Modern Method of Heating

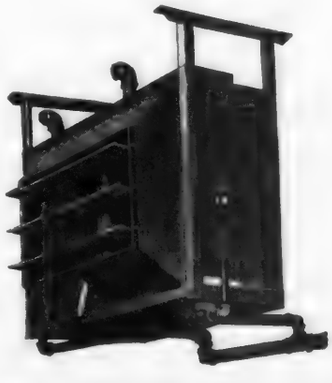
Autovent Unit Heaters

— for garages, factories, foundries, packing plants, drill halls, gymnasiums

Positive Heat Control — Low Cost

The Floor Type:

The floor or pedestal type Autovent Unit Heater is furnished with legs any length desired. Space beneath heater can be used for tool storage, etc. Pipe connections are simple. Motor is of famous Autovent design and fully guaranteed. Unit can be used as cooling device in hot weather.



The Ceiling Type:

Where every inch of floor space is used we recommend the ceiling type Autovent Unit Heater. Suspension arms are furnished whatever lengths desired. These heaters (both types) are so flexible that they respond instantly to a demand for more heat. Can also be furnished for mounting on side wall with brackets.

Write for Data Book

AUTOVENT FAN & BLOWER CO.

730-738 W. Monroe St., CHICAGO

OFFICES IN ALL PRINCIPAL CITIES

helps were shown in the display rooms, which contained exhibits of heating equipment and examples of the various kinds of publicity campaigns employed here and abroad. Oil-O-Matic was shown to be represented in 13 foreign countries. American Radiator Company, Federal Gauge Company, Honeywell Heating Specialties Company, and Kewanee Boiler Company received special mention for their exhibits.

Investigation Started to Reduce Business Wastes

As the first step in bringing to a common focus efforts of the various trades and industries to reduce business wastes which result from trade abuses, misunderstandings and unethical trade practices, the Committee on Trade Relations of the Chamber of Commerce of the United States met in New York, June 29, to lay out a plan of action.

It was agreed that the movement, which has for its purpose the eventual establishment of a complete system of business self-regulation, should, at the present time, take four directions:

1. Promotion of the development of joint trade relations committees within each trade and trade group, including representative manufacturers, wholesalers and retailers, for the adjustment of trade controversies and the establishment of standards of business practice.
2. A survey of the existing agencies for the regulation of trade practices to determine what progress has already been made in this direction.
3. To serve as a medium of information for such trades or trade groups as have already started the adjustment of disputes or the correction of unethical business practices.
4. To co-operate with existing organizations in the development of arbitration as a method of adjusting trade disputes.

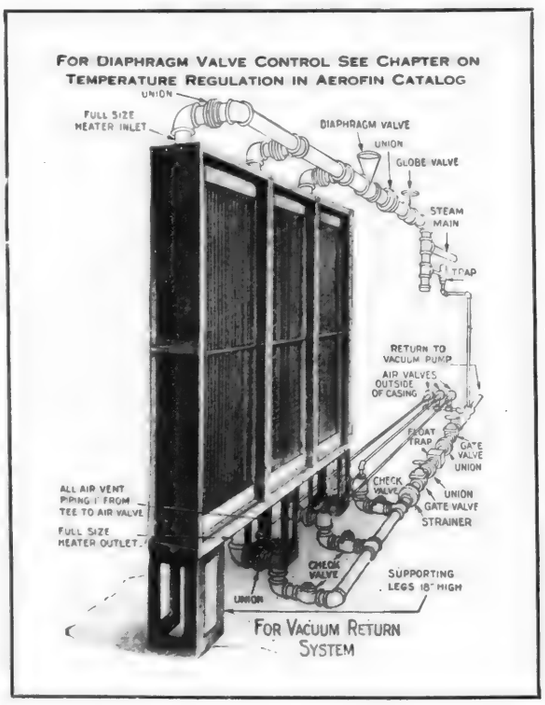
Real Estate Men Accept Building Rating Code

The code for rating buildings, compiled by Better Building Registry of Chicago, whose purposes were outlined in THE HEATING AND VENTILATING MAGAZINE for August, 1925, has been accepted, it is announced, for use this year in the rating of dwellings by the Housing Committee of the National Association of Real Estate Boards, George A. Kelly, of Flint, Mich., chairman.

The basis of this code, it will be recalled, is the rating of four major factors of construction merit: Performance, fire safety, fuel cost and comfort. Under each head, credits are given for such items as the condition of the heating plant and chimneys, heat losses through walls, roofs or upper ceilings, and through windows, under the "Fuel Cost Rating," and footings, soundness of walls, bracing, bridging and other points which affect the permanence of the building. The ratings of each of the four factors, when combined, are averaged to give a proportionate index of value. As the ratings are on the basis of ten-year periods, the use of durable materials provide higher ratings than those obtained with the so-called "cheap" materials. "The index figure which results from our method of rating," said Clyde A. Mann, director of Better Building Registry, "serves to show at a glance the composite merits of the rated building in such a way that the dollars of 'built-in savings' of the good building can be arrived at instantly.

"The speculative builders who want to turn out a good job—and most of them wish to do so—must have the means to prove their work. The ratings are made from reports of three inspections during different stages of construction and, in the case of large buildings, from the certificates of reputable architects, who watch the progress of the work hour by hour.

"As about 80% of the construction of housing is done by speculative builders and the difficulty they faced was the lack of means to prove good work and lack of rated loans, therefore, the Registry ratings are proving the incentive to better building and a fulcrum of leverage to lift the standard of construction to a better level."



AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, *Sec'y and Sales Manager*

AEROFIN
Fan-System Heating Surface

To Engineers, Architects and Contractors

The Vertical Tube Arrangement of Aerofin is preferred because it guarantees perfect drainage of condensation and is less subject to errors of installation and operation. **The Horizontal Tube Arrangement may be used** when installed in accordance with our instructions and diagrams.

The Labor Cost of Installing Aerofin is practically nothing. Two men (without tackle) can handle the units and fit them together like building blocks. **Why pay 20 cents per foot of heating surface for labor of erecting TONS of cumbersome heaters? Use Aerofin and cut down your installed cost for Heaters.**

Aerofin weighs only 1/10 to 1/4 as much as the old fashioned heavy heaters.

Aerofin saves a great deal of space.

Aerofin is made of non-corrosive metals.

Since there is no equal to Aerofin why not specify it outright? Plans and specifications should show sizes, number and arrangement of units with piping details.

Write for catalog, instruction leaflet and service details.
Aerofin is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus.

The efficiency of the Johns-Manville Underground System at completion is at least 90%—and it stays efficient.

Efficiency—after twenty years

THE efficiency of an underground insulation system is important at the time of completion—but it is still more important twenty years after.

We build the Johns-Manville Underground System of Insulation on a "twenty years after" basis—as hundreds of users can testify.

JOHNS-MANVILLE, INC., 292 MADISON AVENUE AT 41st STREET, NEW YORK CITY.
Branches in all large cities. For CANADA: CANADIAN JOHNS-MANVILLE CO., *Ltd., Toronto*

Through Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Underground System of Insulation

An instance of the way the plan works out was cited in which a speculative builder, who is responsible yearly for some 500 houses, called on the Registry with a view to having all his houses rated. He stated that he would like first to submit specifications so that suggestions could be made as to changes and improvements by which better ratings would be assured. He submitted his plans to the Registry and a report was made which pointed out the desirability of adding to his specifications such items as insulation, weather stripping, heavier footing and some minor matters.

In connection with the service of the Better Building Registry, a number of charts have been issued dealing with such items as roofs, ceilings, walls, furnace pipe covering and standard walls. In the last-named chart, seventeen different wall constructions are compared, as to heat loss and possible saving, with a super-wasteful wall, such as that used during the war in the army cantonment buildings. This wall is constructed on the outside of either stucco on lath, or of clapboards without sheathing. No building paper is used. On the inside, lath and plaster about ⅜-in. thick is used, the studs being 2 in. x 4 in. and the wall having no heatstop.

Of the various other constructions listed, that giving the highest grading for fuel saving is a frame wall with clapboards outside, one course of building paper, ⅞-in. tongue-and-groove sheathing, on 2 in. x 4 in. studs. This wall has an inside Class A heatstop, double-thick, between studs, and wood lath and plaster. (Class A heatstop refers to materials which have a conductivity per inch of thickness of not less than 25 B.T.U. and not more than 35 B.T.U. per hour per 100 sq. ft. per degree of difference of inside and outside temperatures. In this particular application, the heatstop is intended to be nailed midway between the inside and outside of the studs or to nailing strips on studs (halfway), nails to be well-driven and not further apart than 4 in. When tightly nailed at edges, this application slightly increases efficiency of heatstop material by additional surface resistance).

"Sheet Metal Worker" Has New Editor

It is announced that Howard E. Jones has been appointed editor of the *Sheet Metal Worker*. Since December, 1919, Mr. Jones has been a member of the staff of the National Trade Extension Bureau of the plumbing and heating industries. He has done much of the editing of the *Monthly Service Bulletin* since that publication was started, and is responsible for originating and producing the advertising, store and window display features, and other sales-promotion material provided by the Bureau. Two books by Mr. Jones, "Compiling and Using a Mailing List Profitably" and "The Why, What, How and When of Collective Advertising," have been incorporated in the Bureau's "Efficiency Course for Master Plumbers or Heating Contractors."

Mr. Jones was born in New York City. In 1916 he located in Evansville as advertising manager of *The Evansville Democrat*. He was with *The Courier* in Evansville during 1918 and 1919.

Round Versus Square Chimneys

Increases in economy and efficiency to be obtained in the use of round chimneys in preference to square ones are pointed out by M. B. Hoffman of the Holland Chimney Company, Holland, Mich., in *The American Artisan* for July, 1926. A recent survey by one of the largest furnace companies, the article states, disclosed that 90% of their trouble-calls had their origin in leaky and defective flues. It is pointed out that back-drafts in the corners of square chimneys, which are dead air pockets, cause the congealing of gases, forming soot, which frequently results in chimney fires. Loss in efficiency due to cracks in chimney lining is emphasized; and, the article continues, coal complaints are caused more often by lack of proper draft than by improper coal.

Spraco Filter Cell

WHY LET

—DUST RUIN—

WHAT

SPRACO AIR FILTERS

WILL

—PROTECT—

Look around you. Observe the interior of buildings equipped with Mechanical Ventilation but without Air Filters. What do you see? Black streaks around all grilles, dust and dirt deposited on goods and furnishings. Have you considered how much a small investment in **Spraco Air Filters** would save?

Send for Bulletin F-81

Spray Engineering Company

60 High Street

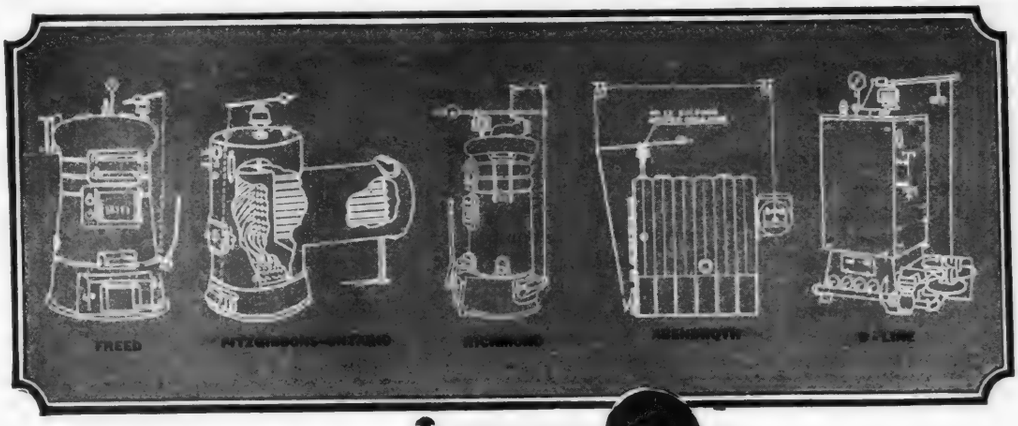
BOSTON, MASSACHUSETTS

Air Washers
Cooling Ponds
Spray Nozzles

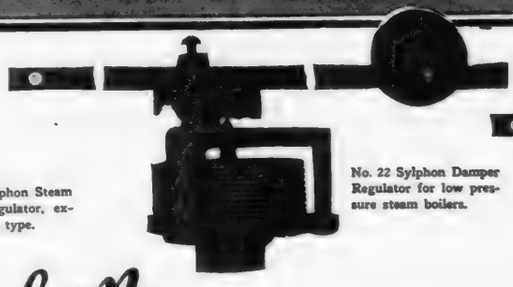
Air Filters
Strainers
Flow Meters

Standard Equipment on all these Boilers

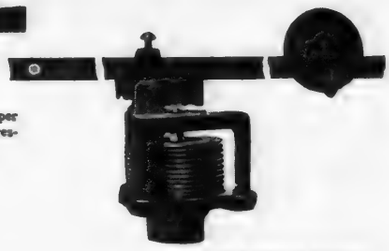
Abendroth	Coatesville	Heggie-Simplex	L-O	Otis-Sawyer-	Ross
Ames	Congress	Imperial	Lansdale	Economy	Senate
Birchfield	Fitzgibbons-	International	Molby	Pierce-Pebco	Spencer
B-Line	Ontario	Economy	Novelty	Putnam	Standard
Burnham	Floral City	Kewanee	National	Richardson	Star
Coil	Freed	Keystone	Oil City	Richmond	Thatcher
					West Coast



No. 924 Sylphon Steam Damper Regulator, extra sensitive type.



No. 22 Sylphon Damper Regulator for low pressure steam boilers.



No. 22-J Sylphon Damper Regulator for low pressure steam boilers with light dampers.

Sylphon Steam Damper Regulators

There is no "lag" in Sylphon Damper Regulators. The sensitive, flexible Sylphon Bellows used as diaphragm gives quick and positive response to changes in steam pressure. This means that it unfailingly checks or opens the draft dampers the instant the pressure in the boiler gets too high or too low, thereby preventing overheating or underheating.

Anyone of the 34 leading boilers listed above comes to you with a Sylphon Regulator attached as standard equipment; or you may install it on any make of steam boiler.

When you insist on genuine Sylphon Damper Regulators for every boiler you install, you guarantee uniform heating with low fuel consumption and completely automatic damper control for the life of the boiler. Refuse imitations.

Ask for Bulletin WDR-5.

Every genuine Sylphon bellows is drawn and formed seamless from a flat sheet of specially prepared metal, with folds or corrugations formed to provide the greatest strength and flexibility.

This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL, SEAMLESS SYLPHON BELLOWS
Sylphon

Breakdown, so common with the ordinary type of thermostat is eliminated, for neither years of constant use nor the powerful action of steam weaken the Sylphon bellows.

THE FULTON COMPANY KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

SALES OFFICES IN: New York Chicago Detroit Boston Philadelphia

and all the Principal Cities in U. S.

European representative— Crosby Valve & Engineering Co., Ltd. 41-42 Foley Street, London, W. 1, England

Canadian representatives: Darling Bros., Ltd. 120 Prince Street, Montreal, Canada

The new round chimney is constructed of four designed blocks, each geometrically correct and interchangeable. They are manufactured of clay and shale products, baked at 1800° F. for two weeks. The chimney brick are made for three sizes of flues; namely, 8-in., 9-in. and 10-in. With these brick there is only one joint to a side, which is closed with 5½ in. of mortar. The joints in the brick are of a convex-concave design, so that each brick, in a sense, interlocks with the brick adjacent. For this reason, disintegrated mortar does not readily drop out. The brick are designed to make a square exterior and a round interior surface.

It is stated that the round type of chimney is constantly wiped clean of soot by the whirling motion of the ascending gases, and that actual tests show the round flue, with unlined but interlocked chimney, to produce more than 30% additional draft over the square-lined type of equal flue area.

Miscellaneous Notes

Building and Engineering Contracts declined very slightly in volume in June, according to the F. W. Dodge Corporation. Construction contracts let during the month in the 37 States east of the Rocky Mountains amounted to $547,792,400. The decrease from May, 1926, was less than 1% and the decline from June of last year was 2%. The good showing for June of this year was due, to a considerable extent, to increased activity in the Pittsburgh district, which had, last month, its highest total so far this year.

In last month's building record were $237,724,900, or 43% of all construction, for residential building; $98,200,200, or 18%, for public works and utilities; $67,960,200, or 12%, for commercial buildings; $54,514,700, or 10%, for industrial buildings; $40,753,400, or 7%, for educational buildings; and $17,036,600, or 3%, for social and recreational projects.

New construction started in the 37 States during the first half of 1926 reached a total of $3,113,158,500, as compared with $2,748,694,800 in the corresponding period of 1925; an increase of 13%. The figure for the first six months of this year was the highest on record for the first six months of any year.

Building and engineering contracts awarded in New York State and northern New Jersey during June amounted to $127,149,600. This is a decrease of 9% from May of this year and an increase of 4% over June of 1925. New England had $38,993,800 in contracts for new building and engineering work last month; a decrease of 18% from May of this year and of 9% from June, 1925. The volume of construction contracts let in the middle Atlantic States during June amounted to $53,067,600; which was a decrease of 9% from May, 1926, but an increase of 18% over June, 1925. The total figure for the Pittsburgh district for last month was $95,061,300. This is an increase of 48% over May, 1926, and of 51% over June of last year. The central west had $146,639,000 for new building and engineering work. This figure showed an increase of 4% over May of this year, but a decrease of 19% from June, 1925. The total for the southeastern States was $51,701,000; a decrease of 12% from May, 1926, and 30% from June of last year. The total volume let in the northwest amounted to $10,398,800. This is a decrease of 5% from May, and of 17% from June of last year. Texas had $24,781,300 in contracts, which was a decline of 15% from May, and an increase of 21% over June of 1925.

Stanley Advertising Co., Industrial Film Division, 220 West 42nd St., New York, is the name of the organization resulting from the amalgamation of Motion Picture Consultants, Inc., New York, with the Stanley Advertising Co. of Philadelphia. This is one of the biggest mergers of producers and distributors of industrial, educational and commercial motion pictures ever effected. A. Pam Blumenthal is president of the new corporation.

Headquarters of the National Warm Air Heating and Ventilating Association have been moved to 168 East Long St., Columbus. The new location is about four squares from the former office.

Fort Mackenzie, Wyo.—Construction was recently started on the new $18,000 central heating plant and electric power plant at the veterans' hospital at Fort Mackenzie, Wyo., under the direction of Captain P. M. Feltham of Washington, D. C., superintendent of construction.

George B. Nichols, consulting engineer, New York, is now in Boston, where he is devoting his time to college building work. His present interest is in the new Harvard Business School which is being built in that city by Hegeman-Harris Company. The school is expected to be ready for occupancy in September, 1926.

Manufacturers' Notes

L. J. Wing Mfg. Co., New York, announces the purchase of the factory property in Newark which it has occupied during the last five years. An extension to the present building, which will increase the capacity of the company 50%, is to be made soon. This company has manufactured ventilating fans, exhausters, forced draft blowers, unit heaters and other heating and ventilating equipment for over 25 years. Its development speaks well for the growth of the heating and ventilating industry.

Drying Systems, Inc., Chicago, manufacturer of the Phoenix constant-effect air filter, announces that it has acquired exclusive rights to the National rotary air filter, formerly manufactured by the National Air Filter Co., Chicago. This acquisition has been made in order that Drying Systems, Inc., may offer a complete air filtration service. Both the Phoenix and the National air filters are now equipped with automatic sediment ejectors.

Charles P. Phelps, 473 Getty Ave., Paterson, N. J., treasurer of the Uehling Instrument Co., announces that he and Charles J. Schmid, his associate, have been appointed Metropolitan, New York and Northern New Jersey representatives for the Uehling Instrument Co. of Paterson, the Williams Gauge Co. of Pittsburgh, the Combustion Control Division of the A. W. Cash Co. of Decatur, Ill., and the National Boiler Protector Co. of Dayton, O. Mr. Schmid was formerly the Boston representative of the Uehling Instrument Company.

Silent Automatic Corp., Detroit, oil burner manufacturers, has opened a factory branch and showroom at 190 Boylston St., Boston. The display rooms, which are located across the street from the Public Gardens, are described as among the finest oil burner showrooms in the country. The branch was officially opened July 15.

Marr Oil Heat Machine Corp., Minneapolis, Minn., reports a $72,000 shipment of Marr Oil Heat Machines to the Philadelphia Electric Company, Philadelphia.

International Heater Co., Utica, N. Y., announces the opening of a new and larger warehouse in New York at 641 West Fifty-ninth St. This warehouse is equipped for immediate delivery of boilers, radiators, specialties, furnaces, one-pipe heaters and repairs. The city district is served by the company's offices in the Fisk Building, Broadway and Fifty-seventh Street.

C. A. Dunham Co., Ltd., Toronto, Ont., announces that T. Berry, formerly of its Ottawa office, has resigned his position to become engaged in architectural work in Kingston, Ont. He is succeeded by G. Ross Hamilton, formerly of Toronto. F. G. Phipps has joined the Montreal sales office, succeeding Mr. Hills who recently resigned to join the Washington, D. C., office. Mr. Phipps has been with the Toronto office of that company since 1926. He has had considerable experience in the mechanical and electrical departments of the Canadian Pacific Railway, and was for several years with the Harbor Commission of Montreal. He is to be assistant of A. Kastello, manager of the Montreal office.

Yeomans Brothers Co., 1433 Dayton St., Chicago, manufacturers of pumping machinery and sewage ejectors, has let contracts for additions which will constitute a 20% increase in the size of its

Get a picture of this time-saver

SEE for yourself why the new Grinnell Column Radiator Bracket saves time-costs. The illustration in the pamphlet we furnish gives you the whole story.

It shows why only one bolt is needed to secure this ingeniously constructed bracket to the wall.

Shows why the bracket can be set without spending a lot of time on accurate measurements, thanks to an extremely liberal range of adjustment.

You'll see, too, that it has only three points of contact, thus practically eliminating the difficulty so often experienced with rough walls.

Send for the illustrated pamphlet and get all the details on this sturdily made time-saver. Address Grinnell Company, Inc., 275 W. Exchange Street, Providence, R. I.

GRINNELL

Fittings, Hangers, Valves, Pipe Bending Welding, Piping Supplies, Etc.

plant. The addition, which will be of reinforced concrete, brick and mill construction, will provide necessary additional space for machining and assembling operations, and for a complete testing plant of 200-H.P. capacity.

Hardinge Bros., Inc., Chicago, oil-burner manufacturers, has re-purchased the Chicago franchise from R. E. Murphy. Mr. Murphy has taken over the sale of the Aetna burner in that city. E. P. Fahey, formerly a partner of Mr. Murphy's, has again joined him in the interest of the sale of the Aetna burner.

American Blower Co., Detroit, Mich., manufacturers of fans and blowers for ventilation and industrial purposes, has invited bids for the construction of a one-story addition to its plant. The new structure will be 162 x 140 ft. and is estimated to cost $100,000. Construction is expected to begin soon.

Dr. John P. Wagner, formerly identified with the furnace-manufacturing industry, has assumed the executive management of the Concrete Products Mfg. Corp. of Florida, concrete block manufacturers. He is located at 705 Ralston Building, Miami.

Imperial Electric Co., Akron, O., manufacturers of A.C. and D.C. motors and generators, announces the appointment of Joseph O'Neill to the position of manager of advertising and sales promotion.

Cutler-Hammer Mfg. Co., Milwaukee, Wis., announces that B. M. Horter has been appointed manager of its Boston office to succeed J. M. Fernald. Mr. Horter has been with the company since 1916, and has been manager of its Wilkes-Barre office and, later, of its Philadelphia office.

A. Harvey's Sons' Mfg. Co., Detroit, Mich., manufacturer of heating supplies, announces that William J. Watson, Jr., has been appointed general sales manager of that company.

Kuhlman Electric Co., Bay City, Mich., manufacturers of Kuhlman power, distribution and street-lighting transformers, announces the appointment of the Continental Sales and Engineering Co., 839 Oliver Building, Pittsburgh, as district representatives in that city. Henry M. Hughes is manager of the Continental Sales and Engineering Company.

New Heating Constants for Insulex

Heat-loss constants for building materials of frame and masonry construction, when equipped with Insulex, are announced by the Universal Gypsum Co., Conway Building, Chicago. The figures are based on tests made by the Armour Institute of Technology, Chicago.

FRAME CONSTRUCTION

SIDE WALL	UNINSULATED	INSULATED By Filling Stud Space with No. 12 INSULEX	
		Lath and Plaster	Gypsolite Plaster Board and Plaster
Clapboard, stud, lath and plaster..	0.345	0.082	0.079
Clapboard, paper, sheathing, stud, lath and plaster.....	0.263	0.076	0.073
Brick veneer, paper, sheathing, lath and plaster	0.251	0.075	0.073
Cement stucco, paper, sheathing, lath and plaster.....	0.255	0.075	0.073

MASONRY CONSTRUCTION

SIDE WALL	UNINSULATED		INSULATED By Using 2-In. Furring Strips and Filling Space with No. 12 INSULEX	
	Plastered Direct on Wall	With 2" Furring Strips	Lath and Plaster	Gypsolite Plaster Board and Plaster
Brick wall.....				
Plastered 8 in.....	0.379	0.272	0.111	0.105
12 in.....	0.296	0.228	0.103	0.098
16 in.....	0.243	0.196	0.096	0.091
Terra-cotta wall, Stucco exterior, Plastered inside				
8 in.....	0.291	0.224	0.102	0.096
12 in.....	0.225	0.183	0.093	0.088
16 in.....	0.184	0.155	0.085	0.081

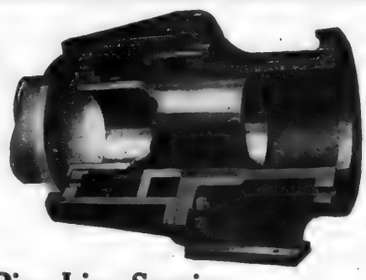
CEILING CONSTRUCTION

	UNINSULATED	INSULATED Filling Space Between Joists 4 In. with No. 12 INSULEX	
		Lath and Plaster	Gypsolite Plaster Board and Plaster
Ceiling joists, Lath and plaster....	0.692	0.082	0.079

New Corporations

Lithman's Air-O-Matic Oil Burner, Inc., Southbridge, Mass., capital $100,000; to manufacture oil-burning apparatus. Incorporators: Arthur A. Blanchard, Louis J. LaBelle, William N. Blanchard, Frederick H. Blanchard, all of Southbridge; Leopold Lithman of Worcester, Mass., and Edwin F. Dakin of Santa Monica, Cal.

HOWARD Guided Expansion Joint



For Pipe Line Service

Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

ALBERGER HEATER CO. 285 Chicago St.
HOWARD IRON WORKS Buffalo, N. Y.

Heating and Ventilation
STANDARD DATA SHEETS

SOME SUBJECTS

B. T. U. Losses
Ducts and Flues
Chimneys
Fittings
Pipe Covering
Flow of Steam in Pipes
One Pipe Steam Systems
Vacuum Heating Systems
Vapor Heating Systems
Gravity Water Heating

326 Sheets Covering 28 Important Subjects
Price 5 Cents per Sheet
Send for folder giving full list and special prices on sets and folder
Price for Entire Set, with Binder, $14.00

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway, New York City

There are two reasons *why*

Every Heating ... Contractor should handle

the VENTURAFIN METHOD OF HEATING

First—It is the most efficient heating method for industrial buildings of every type and description—warehouses, factories, shops, garages and stores, etc.

Second—It is the simplest method to bid on—the easiest and cleanest to handle and install—and it is correctly priced.

Send for this Valuable Book

"The Venturafin Method of Heating"

It contains a complete description of this highly efficient method of heating—gives you valuable tips on where and how you can sell it—contains drawings, photographs of installations, and detailed instructions for figuring and installing. It's yours for the asking. Send the coupon today.

American "Sirocco" TRADE MARK Blower

VENTILATING HEATING
AIR CONDITIONING DRYING
MECHANICAL DRAFT

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.

COUPON

American Blower Company
Detroit, Mich.

Send me the facts about the Venturafin Method of Heating.

*Name*_____

Address _____

*City and State*_____

Underground Steam Construction Co., Boston; capital, $100,000; to conduct heating, power and ventilating business. Incorporators: Erastmus B. Badger, Winchester, Mass.; Charles L. Campbell, Boston; and Edmund T. Keefe, Brookline, Mass.

H. B. Smith Co. Has New Building in Philadelphia

A new warehouse and office building for a branch of H. B. Smith Co., Westfield, Mass., has recently been completed at Forty-ninth St., and Grays Ave., Philadelphia. The main part of the building has one floor, 80 x 200 ft. with a 40-ft. ceiling. Another section, 40 x 80 ft. has two stories, with the offices on the second. There is a railroad siding and a loading platform accommodating four cars. Motor trucks are unloaded at the siding platform and inside the warehouse.

The branch will carry in stock a large supply of popular sizes of radiators, and boilers up to 60 in.

New Firms and Business Changes

Irving E. Brooke, formerly of Muir & Brooke, has opened an office at 1211 Security Building, 189 West Madison St., Chicago, Ill., for the practice of general engineering: design, supervision, investigation and reports. Mr. Brooke is specializing in power plants, heating, ventilating, plumbing and wiring systems, and mechanical equipment.

Boro Heating Co., Brooklyn, N. Y., announces the removal of its offices to 356 Atlantic Avenue, near Hoyt Street, Brooklyn.

Action of Vinco in Removing Oil, Grease, Rust, Scale and Dirt from Boiler

How Vinco acts in removing oil, grease, scale and dirt from the inside surface of new or remodeled or old steam and vapor heating systems is explained in a circular on Vinco, issued by the Vinco Co., 75 Vesey St., New York.

Vinco, it is stated, is an insoluble powder, which divides itself into minute particles throughout the boiler water. These particles attract, absorb and hold the oil, rust and dirt in the boiler, uniting to form flocculent masses of the arrested impurities. The flocculent masses settle to the bottom of the boiler when the fire is banked at night. Each morning, before opening drafts, these masses are removed by drawing off sufficient water through the draw-off cock to lower the level of water in the boiler about 2 in. Fresh water is then added to restore the water level in the boiler.

DUST is the title of a four-page folder (A.I.A. File 30-D-3) distributed by Midwest Filters, Inc., Bradford, Pa., dealing with the dust problem in building ventilation and the way in which Midwest filters solve it. The health and economic sides of dust elimination are treated, along with the principles of installation of the Midwest filters, their efficiency and their operation and maintenance costs.

IDEAL WARMTH AND COMFORT AT MINIMUM COST FOR NEW OR OLD HOMES AND OTHER BUILDINGS is the title of an attractive catalog illustrated in colors received from the American Radiator Co., New York. American radiators and Ideal boilers are treated as to economy, health, uniform heat supply, dependability, cleanliness, caretaking and the effect on property value. Included in the illustrations are Ideal Arcola heating systems for small homes or other buildings, with or without cellar; Ideal Arco round boilers which burn hard coal, soft coal, coke, oil or gas; Ideal water-tube boilers burning hard coal, coke, oil or gas, for medium to large-size buildings; and Ideal smokeless boilers, burning soft coal, for medium to large size buildings. The Ideal Vecto warm-air heater for small homes is also shown. A part of the catalog is devoted to the principles for the efficient control and operation of the heating plant.

TYPE S RECORDERS as manufactured by Charles Engelhard, Inc., 30 Church St., New York, are featured in a circular illustrating the recorder itself, as well as some of its characteristic records. These units are made in six types for different record capacity, with and without distinction between records. The first type is for a single record and the sixth type for as many records in black, red, blue, green, purple and brown. Size 8 x 10½. Pp. 4.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

FOR SALE.—Jennings Hytor vacuum heating pump, size M, 5000 ft., 3-phase, 60-cycle, 220-volt. Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill. (Mr. Born).

POSITION WANTED AS MANUFACTURER'S REPRESENTATIVE. — Correspondence invited to represent manufacturer of boilers and radiators in Washington. Address, J. H. Coleman, District National Bank Building, Washington, D. C.

SALES ENGINEERS WANTED.—We require for our New York and Philadelphia branches, technically-trained men who have made their mark at selling vapor, vacuum or low-pressure heating systems. Men of personality who have earned the entree to architects' and engineers' offices, men willing to work and able to see a really big future for themselves, men who can sell a nationally-known heating system of proven and acknowledged worth. If you can qualify, please address Box 84, care of Heating and Ventilating Magazine.

POSITION WANTED.—Heating engineer, thorough, competent man is available as sales manager, engineer, local representative for boiler and radiator manufacturer, oil burner or specialty. Familiar with all branches of business. Twenty years' experience. Headquarters, New York. Credentials. Address Box 83, care of Heating and Ventilating Magazine.

POSITION WANTED.—Position wanted by young man, six years' experience laying out heating and ventilating systems. High school and some college training. Four years Cooper Union. Desires job with heating and ventilating contractor, doing estimating, inspecting and, if necessary, designing. Address Box 82, care of Heating and Ventilating Magazine.

ENGINEER'S ASSISTANT WANTED.—Young man living in New York or suburbs, with general knowledge of heating systems, to join and make a place for himself in a large and long-established company. State age and previous experience. Address Box 81, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters desires recognized representatives on commission basis. Address Box 53, care of Heating and Ventilating Magazine.

MANUFACTURING OPPORTUNITY.—Correspondence is invited from a manufacturer relative to automatic humidifying radiator cabinets described on Page 111, May issue of The Heating and Ventilating Magazine. Proposition will be kept confidential. Address Box 85, care of Heating and Ventilating Magazine.

"Readers Announcement"

Our Educational Service is being extended to readers of THE HEATING AND VENTILATING MAGAZINE. It is for Manufacturing and Contracting folks, as Employers, Draftsmen, Salesmen, Mechanics, Clerks, Apprentices, etc.

Since 1910 the St. Louis Technical Institute has taught quite an army of folks desiring to improve their opportunities. Our courses are Modern, Comprehensive and Official, and designed to give you those higher, finer touches your profession requires.

We Teach You In Your Own Home, Personal, Clear, Direct.

Our School Directory sent Free to interested parties. Indicate your Course when writing.

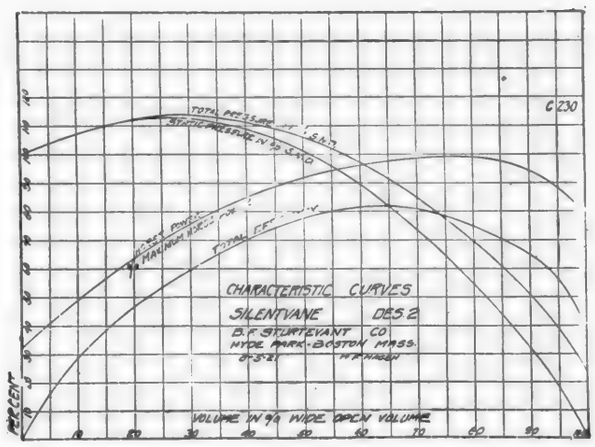
HEATING VENTILATING ENGINEERING
SPECIAL STEAM AND WATER HEATING
PLUMBING DESIGN AND INSTALLATION
WARM AIR HEATING
CONTRACTING AND ESTIMATING
MECHANICAL DRAFTING

Start with the 1925-26 School Season

ST. LOUIS TECHNICAL INSTITUTE
4541 Clayton Ave., St. Louis, Missouri

Sturtevant Silentvanes

are the ideal fans for ventilating



Why are over a thousand Silentvanes successfully ventilating many of the country's most prominent buildings, such as The Roosevelt Hotel, New York; Union Trust Co. Building, Cleveland; Edgewater Beach Hotel, Chicago; First National Bank Building, Boston, and Olympic Hotel, Seattle?

The curves opposite show the answer. High efficiency—hence the least power. Silentvanes cut fan operating costs 25% to 30%. Silentvanes do not fall down if working conditions are not exactly as estimated. No worry about overloaded motors—self-limiting horse power characteristic prevents overload and permits use of motors considerably smaller than would be required for other types of fans.

What Silentvanes are doing for others is a good indication of what they can do for you. Specify Silentvanes and save Power.

Our new Silentvane Catalog No. 290 contains valuable information for the architect. Send for your copy now.

B. F. STURTEVANT COMPANY

Sales Engineering Offices

Atlanta, Ga. — Los Angeles, Cal.
Boston, Mass. — Minneapolis, Minn.
Buffalo, N. Y. — Montreal, P. Q.
Camden, N. J. — New York City
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Dallas, Tex. — St. Louis, Mo.
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Denver, Colo. — San Francisco, Cal.
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Plants located at

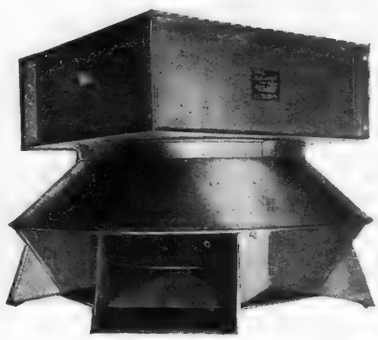
Hyde Park, Mass. — **Berkeley, Cal.** — **Camden, N. J.**
Sturtevant, Wis. — **Framingham, Mass.** — **Galt, Ontario**

Sturtevant
PUTS AIR TO WORK

Foreign Representatives

American Trading Co. — Tokio
American Trading Co. — Shanghai
Catton Neill Eng. & Mach. Co. — Manila
H. P. Gregory Co., Ltd. — Sydney
Honolulu Iron Works Co., — Honolulu, T. H.
Blair, Reed and Co., Ltd. — Wellington
Wesselhoeft and Poor — Caracas
Wesselhoeft and Poor — Bogota
General Machinery Co — Tampico
Pedro Maritino Inc. — Lima
Compania Italio-Americana de Importacion — Buenos Aires
A. E. Barker — Johannesburg

Wing Featherweight Unit Heaters for Low Buildings



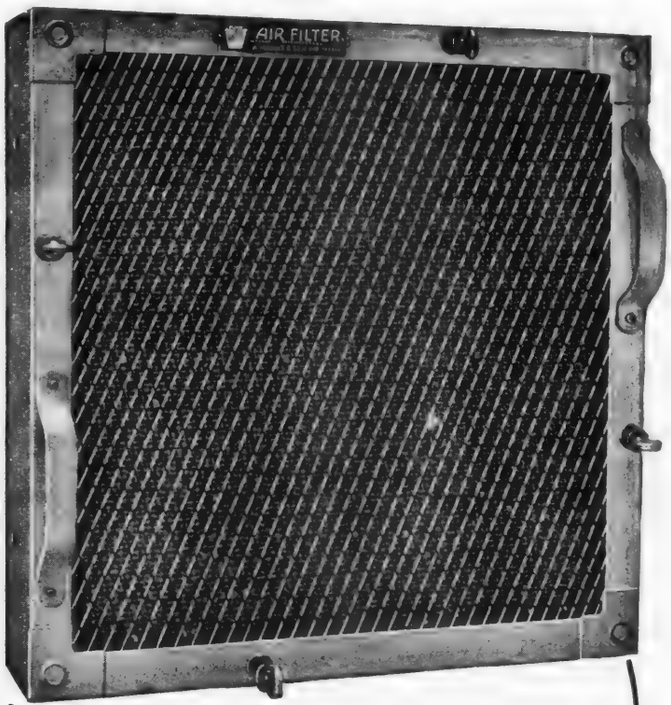
In low buildings uniform distribution of the heat supplied is all important. Heat delivered to such a building from a single point and in but one direction will create uncomfortable vitality sapping hot spots.

The low ceiling type of Wing Featherweight Unit Heaters is provided with 4 air outlets, each discharging in a different direction downward toward the floor. This assures uniform heat distribution to all corners of the building, and the overhead installation adopted on all Wing installations not only saves valuable floor space but makes possible the heating of the working level first and greatly simplifies steam and return piping.

L. J. Wing Mfg. Co.

Fans and Exhausters *Forced Draft Blowers*
Small Turbines *Unit Heaters*

Hudson & 13th Sts. New York City

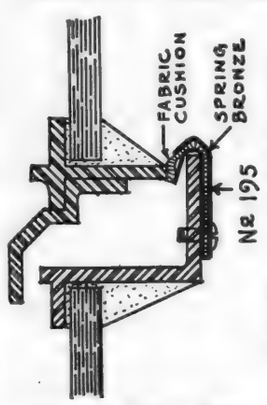


TRADE DURO MARK
COPPER MEDIA Duro ALL METAL AIR FILTER CO.

3151 Shields Ave., Chicago, Ill.

Athey *Cloth-lined metal* Weather Strip

A metal-to-cloth contact is the only method yet devised which makes a weatherstrip air and dust tight without making the windows hard to open and close. The ATHEY (patented) is the ***only cloth-lined metal weatherstrip made.***



Special Athey Strip for Steel Sash

The metal channel and rail are of imperishable zinc—they will not rust. The cloth used is guaranteed by us to be rot-proof, damp-proof, and moth-proof. Water or ice will not affect it. It won't pull out.

For Wood or Metal Sash

Specified by leading architects; used in finest buildings all over the country.

Write for complete information

Athey Company

6097 W. 65th Street - Chicago, Ill.

Buffalo Unit Floor Mounting

"Heat with Unit Heaters" use "Buffalo" Unit Heaters for results

BUFFALO-UNIT HEATERS ARE:

1 EASY TO INSTALL
2 HIGHLY EFFICIENT
3 MADE WITH A VARIETY OF OUTLETS
4 LOW IN FIRST COST AND IN MAINTENANCE COSTS
5 SHIPPED PROMPTLY

For heating warehouses, garages, machine shops, shipping departments, freight sheds, shops and factories of all kinds, round-houses, and any other place where heat is required, the Buffalo Unit Heater is unexcelled.

Made in a complete range of sizes, these units have an enormous heating capacity. Various types of coils are supplied to meet existing requirements.

Simple to install, requiring practically no attention and operating continuously or as desired, the Buffalo is the ideal heater. Write NOW for your copy of a new catalog we are preparing, showing all types and styles.

BUFFALO FORGE COMPANY
480 Broadway Buffalo, N. Y.
In Canada—Canadian Blower & Forge Company, Ltd.
Kitchener, Ont.

"Buffalo" heating and ventilating equipment

De Bothezat Disc Pressure Fans

and Filter Units

to be installed in Central Exchanges of the

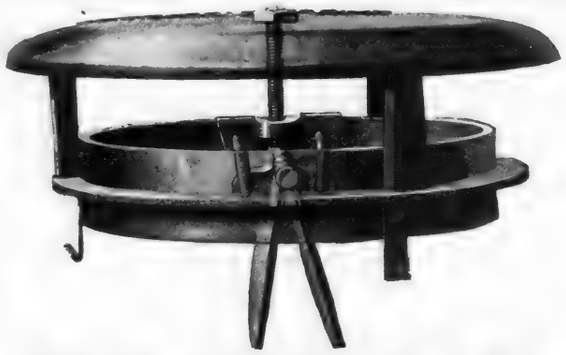
NEW YORK TELEPHONE COMPANY.

WHY?

Because De Bothezat Disc Pressure Fans develop Static Pressure with very high efficiency.

Catalogue "HV" upon request

De Bothezat Impeller Company, Inc.
1922 Park Avenue, NEW YORK CITY

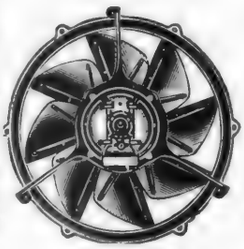


ÆOLUS DICKINSON CO.
3336-44 So. Artesian Ave., Chicago

JAMES M. SEYMOUR
Established 1888
Lawrence St., Mechanic St. and Kirk Place, NEWARK, NEW JERSEY

AUDITORIUM FANS, 36" to 120" to fit any square opening. SEYMOUR FANS sold subject to substantial discount. Furnished with suitable pulley or coupling for direct connection TWIN FANS include shafting and center bearing.

Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.



SEND for BULLETINS, PRICES, and DISCOUNTS

SEE OUR DETAILED DATA IN ASH&VE GUIDE

MANUFACTURED WEATHER
makes
"Every day a *good* day"
Humidification · Dehumidification
Heating · Ventilation · Purification
Drying

Carrier
Engineering Corporation
750 Frelinghuysen Ave. Newark, N. J.
Boston Cleveland Chicago New York Philadelphia Los Angeles Kansas City

SEE OUR DETAILED DATA IN ASH&VE GUIDE

On scaffold ready to connect.

Two men do the entire job.

Completely installed in 30 minutes.

A New Era in Heating Installation and Efficiency

MODINE Unit Heater marks a new era in heating installation and efficiency that is revolutionary in its application. Complete installation is made in 30 minutes. The unit suspends from the overhead steam or hot water line at any discharge level desired. A length of pipe and a union represents all of the material needed. Less than 4½ cubic feet of space occupied. Tons of dead weight are replaced by pounds. The Modine Unit weighing 125 pounds equals the heating capacity of 700 square feet of direct radiation. Delivers 2000 cubic feet of heated air per minute in any direction. At 60 degrees room temperature, the B. T. U. discharge is 163,000 per hour.

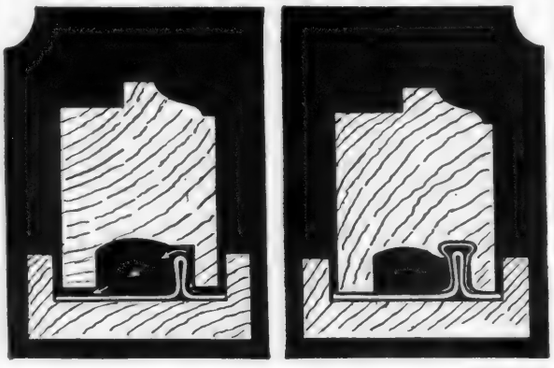
Write for Bulletin "A" which contains all of the facts relating to this revolutionary heating.

MODINE MANUFACTURING COMPANY
HEATING DIVISION ThermoModine (Invented Heating) RACINE, WISCONSIN
Chicago Sales Office, 720 Cass St., Chicago, Ill.

MODINE
UNIT HEATER
FOR STEAM OR HOT WATER HEATING SYSTEMS

The illustration shows how simple it is to DIRECT THE HEAT from the Modine Unit Heater WHERE NEEDED —toward a bad door or window, lathe, work benches, etc. One man with a wrench does it in a few minutes' time.

HIGGIN
ALL METAL
WEATHER STRIPS



Ordinary single-member strip
Sash grooved for cord

The exclusive Higgin Insert
Strip completes the job

Are you recommending the right weather strips?

The only weatherstrips made with a self-holding spring-flange **Insert** are Higgin All-Metal Weatherstrips.

No window without this **Insert** can be as draft-tight as a Higgin-equipped window. The illustration shows why.

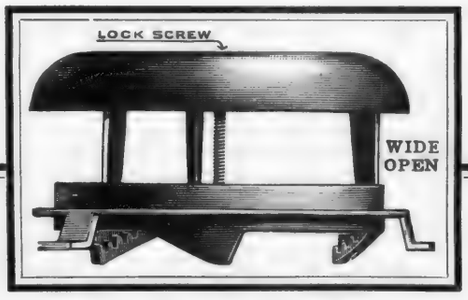
The spring flanges of the **Insert** lightly grip the sides of the raised rib and close the space around the sash at every point.

There is no air leakage where the sash is cut out for the cord, nor seepage around the rib when the sash shrinks. The metal-to-metal contact insures a perfect fit and closure; also an easy-sliding sash under all conditions.

A Higgin Installation means added comfort, greater fuel saving, increased satisfaction with the heating system.

HEATING ENGINEERS! You can safely guarantee a definite heating efficiency for your equipment when Higgin All Metal Weatherstrips are installed. They keep all the cold air out and all the warm air in. They never lose their close fit by warping or shrinkage of frames. Every job is installed by trained Higgin men and guaranteed by the Higgin organization. Recommend Higgin All-Metal Weatherstrips to your customers.

The HIGGIN Mfg. Co.
Newport, Ky.
Toronto, Canada.
Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens



Nu-Notch
REG. U.S. PAT. OFF.

Mushroom

Something new in the ventilating industry is our improved ventilator for theatres, auditoriums and like types of buildings—the NU-NOTCH!

The NU-NOTCH has taken a leading place because of its mechanical perfection, and unobstructed throat—permitting the free passage of air. It is easily adjusted to many regulations, and when adjustment is made, no idle foot may kick it out of place—the lock screw fastening it firmly in place in recessed notches.

Our Engineering Department invites questions and investigation of all features of the NU-NOTCH. Let us send full details.

Knowles Mushroom Ventilator Co.
202-204 Franklin St. **NEW YORK CITY**

"ABSORBO"

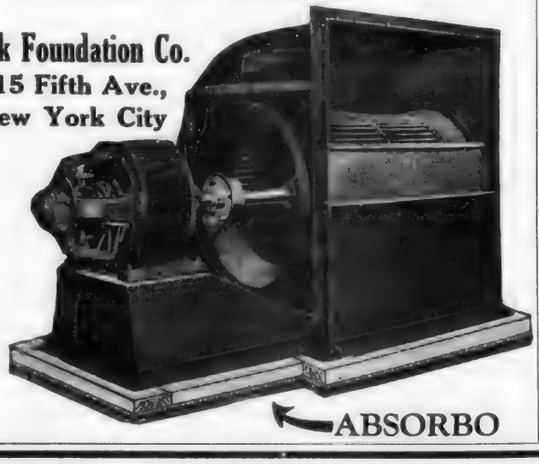
Deadens Vibration and Noise

When "Absorbo" is used beneath the base of a fan or motor, vibration is arrested and noise eliminated.

"Absorbo" is made of specially selected strips of natural cork. It is impregnated with creosote which makes it impervious to oil and water, and retains its natural oil and moisture.

Our Engineering Department will assist you in solving your problems.

Cork Foundation Co.
315 Fifth Ave.,
New York City



FRANCIS JOSEPH REITZ HIGH SCHOOL ADDITION, EVANSVILLE, INDIANA

J. C. LLEWELLYN CO., Chicago, Ill., Architects
CHAS. L. TROUTMAN, Evansville, Ind., Asso. Architect

Heating Contractor
GOTTMAN & WEBER CO., Evansville, Ind.

Evansville Also Adopted Heatovents for the Above New School Now Under Construction

ARCHITECTS, contractors and school boards everywhere are enthusiastic about the appearance and performance of the Buckeye Heatovent.

It is finished with the same care and workmanship as any fine piece of furniture or expensive automobile. The Buckeye Heatovent, unit system of heating and ventilating, is made in any finish and will harmonize with the interior of your particular building.

Upon request we will send you an illustrated booklet giving full information about the Buckeye Heatovent.

Buckeye Heatovents incorporate the latest and best engineering principles and are constructed of the very highest class materials and workmanship. These features, together with that intangible asset "Buckeye Service," insure your clients against poor ventilation and future repair bills.

The Buckeye Blower Company
Columbus, Ohio

BRANCH OFFICES:

216 Bona Allen Bldg., Atlanta, Ga.
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2017 Fourth Ave., North, Birmingham, Ala.
321 Jackson Building, Buffalo, N. Y.
301 Rose Building, Cleveland, Ohio
401 Transportation Building, Chicago, Ill.
3115 No. Central Ave., Indianapolis, Ind.
1226 California St., Denver, Colo.
400 Penobscot Bldg., Detroit, Mich.
1400 Broadway, New York, N. Y.
1011 Pioneer Trust Co. Bldg., Kansas City, Mo.
321 Bulletin Building, Philadelphia, Pa.
709 Columbia Bank Building, Pittsburgh, Pa.
210 Dooly Building, Salt Lake City, Utah
Fales Building, Seattle, Wash.
226 Kirk Ave., Syracuse, N. Y.
1101 Realty Building, Youngstown, Ohio

SPRING-LIKE TEMPERATURE THE YEAR ROUND

The double function of the Dwyer *Twinfan* Unit Heater—supplying uniform heat in winter and good ventilation in summer—enables users to maintain a moderate spring-like temperature in their factory or garage throughout the year.

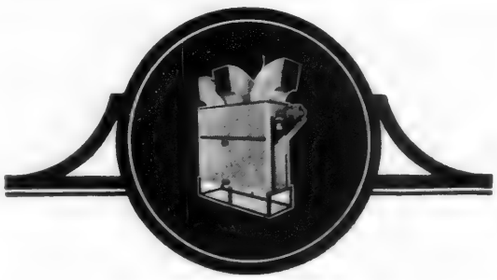
Heat control is instantaneous—turn the switch, and the heat is on or off. Opening windows (which is the finest way in the world to waste heat) is never necessary to keep a *Twinfan*-heated building at the right temperature—simply turn off the fans. The unit gives off sufficient heat by gravity to keep the building at a comfortable temperature.

In the summer the *Twinfan* Unit Heater serves as a ventilator. By operating the fans in summer a constant circulation of air is maintained, and this recirculation has a cooling effect in the building.

Twinfan Units give the kind of satisfaction which builds up a profitable repeat order business for the heating engineer who installs them.

Let our engineers assist you on your next heating job.

DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.



JOHN P. SMITH, INC., Philadelphia Heating Engineers, USED YORK UNIT HEATERS ON FOUR JOBS for the Atwater Kent Mfg. Company of Philadelphia. In August 1923, they ordered two York Units and three of a competitive unit, for the first section of this new plant. They were thoroughly tested and compared over the heating season of 1923-24. In April 1924, 22 York Units were ordered for the remainder of the plant. In December 1924, they ordered 16 more units to heat another section of the plant and in April 1926, they ordered 16 more for an addition.

Both "Smith" and "Atwater Kent" must be thoroughly convinced of the superiority of York Unit Heaters, otherwise we would hardly have received four orders, making a total of 54 units, for heating this 10 acre, one story building.

Let us work with you on your heating problems. Send for complete information. Offices in all principal cities. Address York Heating & Ventilating Corp., 1508 Locust St., Philadelphia, Pa.

York Heating & Ventilating Corp.
1506 Locust Street PHILADELPHIA, PA.

Bracket as used on Saw-tooth or Sky-light construction.

No. 2 for Horizontal Wall Radiators

Patented

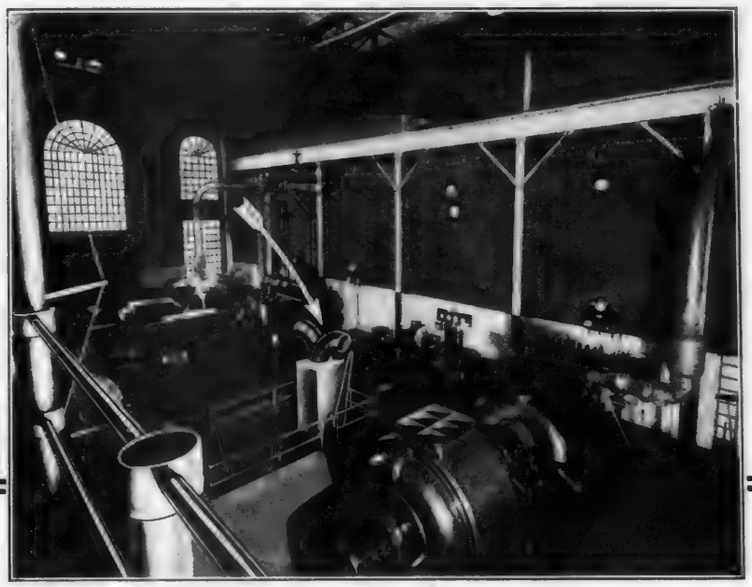
Safe Durable Convenient

These qualities are built into Gleockle Wall Radiator Brackets because they are made by men who know bracket requirements.

They are also adjustable, easy to erect, inexpensive, invisible after erection, and will fit any make of wall radiator.

Let us send you descriptive booklet and trade discounts.

A. F. GLEOCKLE, Jr. 415 Bay Street ROCHESTER, N. Y.



A Pecco No. 330 Steam Unit Heater in the Laclede Gas Co. plant, St. Louis. This is an unusual installation because all steam lines in the plant are so well insulated and warm air from the generators is discharged outside of the building so that the temperature inside is normally so low as to congeal the oil in the oil lines to the turbine bearings. Pecco Heater installed as a standard unit carrying 125-lb. steam pressure. Note well below heater opening into pump and condenser room below.

Uniform Air Distribution

Pecco Unit Heaters provide uniform air distribution by *recirculation* of all air in the open building space. This is the reason for their unusual effectiveness and their ability to maintain proper temperature throughout the working zone in the open building space.

They are designed on fundamental natural laws: First, because the cold air intake is placed at the cold air level; and second, because the warm air outlet is placed at the warm air level. A special feature of the cold air intake is the "scroll" bottom underneath the fan, which assures a perfect "stream line" air distribution.

Pecco Unit Heaters are extensively used and have the unqualified indorsements of heating engineers and industrial plants throughout the country. Write for details.

PECCO, INCORPORATED, 2980 N. Market St., St. Louis, Mo.

This external view shows some Pecco Unit Heater features. Note that the cold air intake fan is located where it belongs—near the floor at the cold air level. The Pecco fan is provided with a large number of special-shaped blades which are closely spaced and so pitched that the fan, when revolving at slow speed, permits delivery of a maximum volume of air. The fan "scroll" bottom (underneath the fan and not visible in the illustration) assures perfect "stream line" air distribution.

PECCO UNIT HEATERS

"They Keep The Whole Place Warm"

"No Radiation is Needed to Heat this Factory"

WHEN the question of *plant heating* is being considered, before you contract for an elaborate steam or hot water system with its costly radiation, investigate the Mueller Direct-Fired Forced Air Unit.

Engineers and plant owners find that this forced air unit heater not only gives more satisfactory heating and ventilating service, but is also far more economical in first cost and maintenance. It requires no radiation. Burns low grade fuel. No danger of freezing, breakages or shut-downs. You don't need a licensed engineer to run it.

The Mueller Unit provides a positive circulating system for peak loads and quick heating periods and a gravity system for night operation or when building is unoccupied. It may be operated singly, in independent units, or in batteries, to obtain satisfactory temperature. Forced circulation assures movement of a large volume of air throughout plant. Infiltration vitalizes air already in building. Efficiency of workmen is increased because stagnant air is eliminated.

Write for descriptive literature and let our engineering department confer with you regarding your heating requirements.

L. J. MUELLER FURNACE CO.
Established 1857
267 Reed Street
MILWAUKEE, WIS.

Branch Offices: Baltimore, Chicago, Detroit, St. Louis, St. Paul, Minneapolis, Fort Collins, Colo., Salt Lake City, Portland, Seattle.

MUELLER
· Direct-Fired · Forced Air Unit

The Fan with a "Degree" ME

The new Type ME Fan has a certified performance sheet—obtained from competent, disinterested, outside engineers who have tested it in their own laboratories.

Just drop us a line for complete data on this remarkable fan.

Fans
Unit Heaters
Air Washers
Blowers
Furnaces

NEW YORK BLOWER COMPANY

General Offices
2242 So. Halsted
Chicago

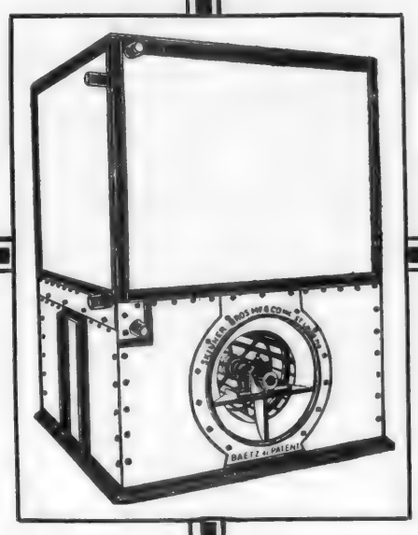
E-Z
RADIATOR HANGER

WE couldn't afford to say E-Z Radiator Hangers are adapted to any ordinary wall construction unless we KNOW! Two-by-four studding has all the strength needed to hold the pull on the anchor bolt.

Style R

HEALY-RUFF CO.
772 Hampden Avenue,
ST. PAUL, MINN.

"A big help to Customers"



Backing up your judgment with dependable performance

You need fear no embarrassment because the equipment failed to come up to expectations, if you recommend

Skinner Bros. Steam Coil Heaters

Not only will the heaters prove themselves fit for long, efficient service, but the cooperation of the Engineering Department of the Manufacturers is your guarantee that there will be nothing but expressions of satisfaction after the installation is completed.

Buildings that are considered difficult to heat—large proportions of glass, huge volumes of cold air infiltrating from out of doors—monitor or sawtooth type—such are among the classic examples of what Skinner Bros. Steam Coil Heaters can do in effective and economical heating.

There is a Skinner Bros. Direct Fired Unit for use where steam isn't available.

Large factories in St. Louis and Elizabeth, N. J., assure delivery as desired.

Branches and sales offices in charge of competent engineers in principal cities place within reach every possible cooperation you may wish.

SKINNER BROS. MFG. CO., INC.

The Pioneer Manufacturers of Unit Heaters

Home Office 1404 S. Vandeventer Ave., St. Louis
Eastern Office 1014 Flatiron Bldg., New York

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Boston	Indianapolis	Pittsburgh
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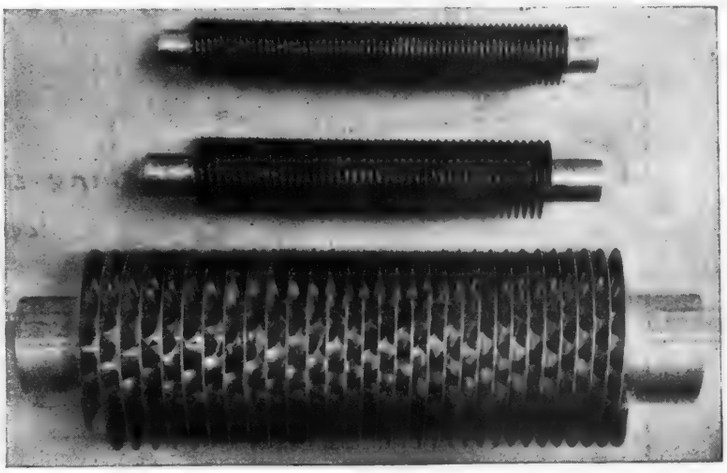
Chicago		Spokane
Cleveland		Washington

Skinner Bros. Steam Coil Heaters are recognized as leading equipment for heating and air conditioning—

- Automobile Factories
- Candy Factories
- Creameries, Dairies, Milk Plants, Condensories
- Dye Houses
- Foundries
- Furniture Factories
- Garages and Repair Shops
- Laundries
- Packing Plants
- Printing Shops
- Paper Mills
- Railway Shops
- Shoe Factories
- Soap Factories
- Stone and Marble Works
- Textile Mills
- Woodworking Shops

and thousands of miscellaneous factories, mills and shops.

6 to 10 times as much surface as plain tubes of same size



SCHUTTE KOERTING

RADIAFIN TUBES
for heating or cooling air

6 sizes—¾" to 3"—all lengths—plain ends or flanged—with or without headers.

The radial fins insure maximum heat transfer

These tubes will be on display in Machinery Hall at the Sesquicentennial.

SCHUTTE & KOERTING CO., 1153 Thompson St., PHILADELPHIA, PA.

When You Buy Air Filters —*Ask These Questions*

1. Is the filter built in two stages to prevent the building up of a resistance to the air flow and allow for easy cleaning?
2. Has the filter a renewable oil pad to prevent the cell from drying out between chargings?
3. Will the filter continue to operate efficiently with continued low resistance over a long run?

Ask these questions of the next air filter salesman who calls—and in the meanwhile send for your copy of our new booklet, "Eliminating Dust and Dirt with Tangldust Air Filters."

Manufacturers also of

Cooling Towers Air Washers
Spray Nozzle Cooling Systems

Branches in Principal Cities

TANG L DUST AIR FILTERS

MADE BY THE COOLING TOWER COMPANY, INC.-15 JOHN STREET, NEW YORK

TURTLEBACK
TRADE MARK

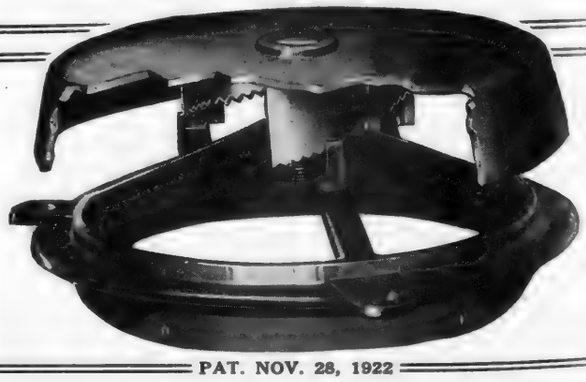
It is vitally necessary that the air of a theatre, school or auditorium be regulated—the free flow of air provided—the overflow checked.

"TURTLEBACKS" are highly advantageous for the fan system used in buildings like and similar to those mentioned, where close regulation and free air flow are demanded.

Regulation of "TURTLEBACKS" is achieved by means of three supporting webs, graduated to 1/16 in. variations in the height of the opening, and held rigidly in place by the central locking screw.

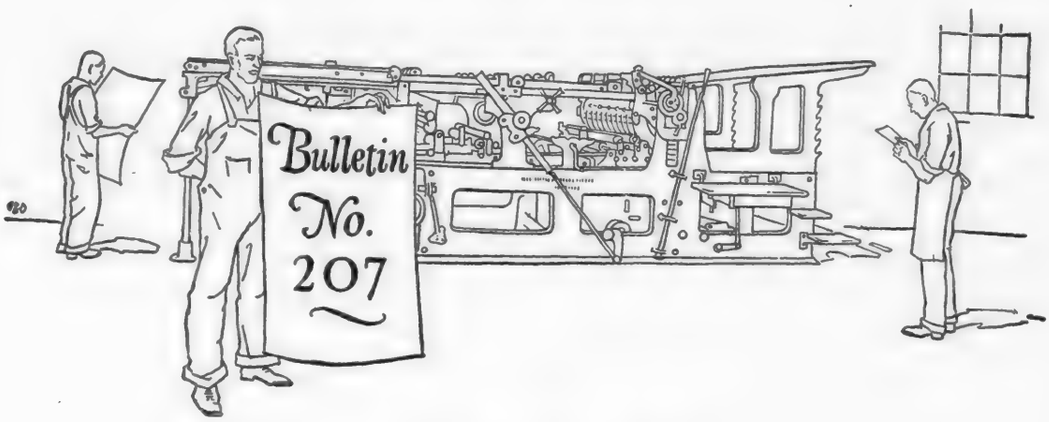
Let us send full details.

VENTILATING PRODUCTS CO.
Not Inc.
2800 Cottage Grove Avenue, CHICAGO, ILL.



PAT. NOV. 28, 1922

Universal Heating & Ventilating Unit



Just off the Press

OUR NEW BULLETIN, NO. 207, introducing the new quiet-operating, brushless type, single phase motor is now ready for distribution. It fully illustrates this new motor and contains complete electrical data along with a typical specification.

Where shall we send your copy?

Universal Heating and Ventilating Unit is obtainable thru Sales Offices of the AMERICAN BLOWER Co. in the principal cities throughout the United States and Canada. For a copy of Bulletin No. 207 or other information write either to us or to the nearest AMERICAN BLOWER OFFICE.

JOHN J. NESBITT, INC.

213 NORTH VERMONT AVE., ATLANTIC CITY, N. J.

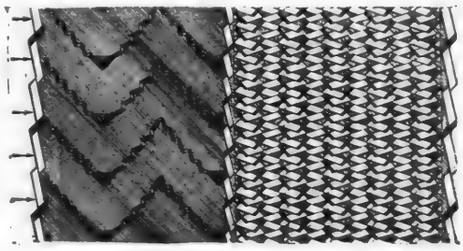
405 LEXINGTON AVE., NEW YORK CITY

After Years of Experience in the Ventilating Field

we originated, developed and perfected

The GENERAL Air Filter

Today, its outstanding efficiency, low average resistance and extreme ease of cleaning are recognized by authorities on ventilation.



Section thru General Air Filter Cell.

FIRST STAGE—Consists of continuous and overlapping baffles. Baffles form troughs that hold oil. Removes all coarse dirt and ⅞ by volume of all the dirt.

SECOND STAGE — Only the fine dirt enters this stage and is caught on sticky oil coated surfaces of densely packed special expanded metal. Will not clog.

A DISTINCT ADVANCE IN FILTER DESIGN

Not "just another filter"—but a scientifically designed unit that has been repeatedly tested in a special laboratory, equipped with dust detecting apparatus loaned by the U.S. Bureau of Mines.

These tests resulted in orders by leading engineers and architects.

Visit out laboratory. Consultation, tests and recommendations are obtainable without obligation.

WRITE FOR BULLETIN

General Air Filters Corp.

MANUFACTURERS

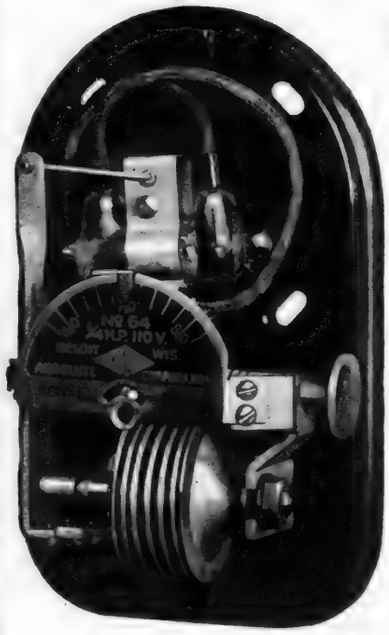
Air Purification Equipment

110 WEST 42ND STREET NEW YORK CITY

CON-TAC-TOR

THERMO-SWITCH

Practical
Simple
Safe



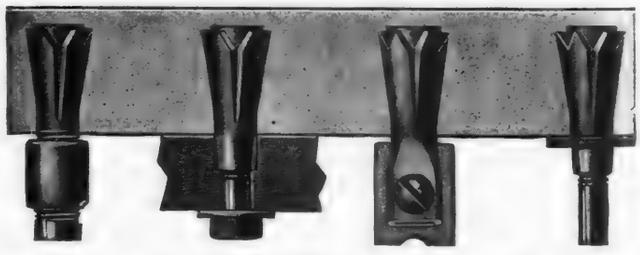
High Voltage Switches Motor Without Relay.

For
Oil Burners
Unit Heaters
Forced Draft
Coal Burners
Etc.

A complete line of Automatic High Voltage Controls listed in Bulletin O-7

ABSOLUTE CON-TAC-TOR CORPORATION

BELOIT, WISCONSIN



Phillips Self-drilling Expansion Shells

For fastening all types of hangers to concrete ceilings, side-beams, columns and walls, and for bolting timbers and other equipment to concrete and stone.

Installing Self-drilling Shells in Concrete

Every shell is a drill and makes its own hole, thus eliminating drill trouble and expense.

A new sharp drill for every hole and a smaller hole per given size bolt reduces labor cost of installing to absolute minimum.

A perfect fitting hole and the enlargement of shell and hole at extreme bottom insures reliability and better workmanship.

Quickly installed with the Phillips Spring Hammer, or with special hand chucks.

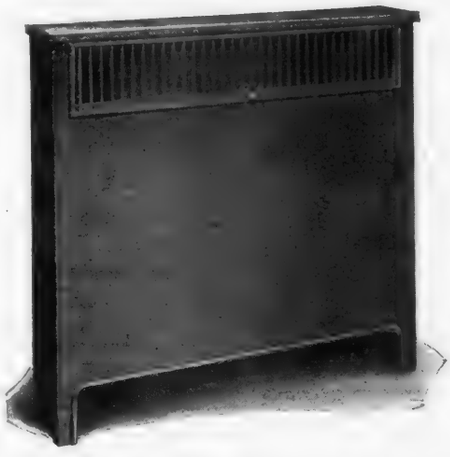
Ceiling with Phillips Spring Hammer Drill

Manufactured by

PHILLIPS DRILL COMPANY

1537 Cortland Street CHICAGO, ILL.

New! PEERAD Heating Cabinets



THE new PEERAD Heating Cabinet is built to meet the demand for better-looking heating equipment in residences, apartment buildings, hotels, etc. It occupies little space—much less than ordinary radiators—and can be of any practical height or width required, depending upon the amount of radiation. The cabinet is made of furniture steel, attractive in appearance, and can be finished in any color to harmonize with the surroundings. Inside the cabinet is a highly efficient and compact copper radiator, and equipment for humidifying the air can be provided if desired. A convenient shutter at the top provides a control of room temperature in addition to the usual steam valve.

Circulation of air is effected by gravity, the air entering at the bottom and passing out through the grille at the top after being heated. The bottom is left open, as shown, for convenience in sweeping and cleaning.

Similar units can be furnished for built-in construction, with air intake at the floor line and warm air outlet through a grille at any point desired.

This unit is designed by Peerless engineers who have had twelve years' experience with heating and ventilating units. It is the result of much careful study of the requirements. It not only has the advantages of saving space and eliminating unsightly cast iron radiators, but also has distinct advantages from an engineering standpoint, owing to the special features of the copper radiator used.

Send for more information concerning this new heating cabinet. If you wish to see our local representative, please so state.

PEERLESS UNIT VENTILATION CO., INC.

Pioneers in Unit Ventilation

Skillman Avenue and Hulst Street, Long Island City, N. Y.

CHICAGO 808 Monadnock Bldg.	SPRINGFIELD, MASS. 196 Worthington St.	CLEVELAND 1836 Euclid Avenue	DES MOINES 520 Securities Building	MINNEAPOLIS 240 Seventh Ave., S.
BOSTON 100 Boyston St.	PITTSBURGH 301 House Building	DETROIT 723 Lafayette Bldg.	PORTLAND, ORE. 927 Board of Trade Bldg.	TORONTO, CANADA Darling Bros., Ltd., 77 York St.

THE NATIONAL PIPE BENDING CO.

COILS *and* BENDS

If your process demands coils, you can depend on National products for

High temperatures
High pressures
Corrosive liquids
Volatile liquids
or any other need.

A better coil in design, material and fabrication

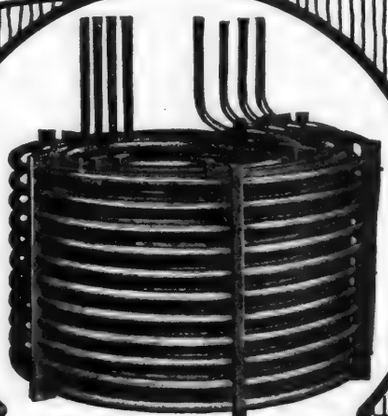
With or without couplings or screwed fittings. Iron and steel coils electrically welded; copper and brass coils brazed.

Unusual coils a specialty

While our standard makes fill many requirements, we can fill any order for unusual bends.

Write for quotations

Send sketches or specifications. Let us quote on replacements now for new coils you will need. We believe our quotations will interest you.



The National Pipe Bending Co.
Est. 1883
120 River St., New Haven, Conn.
Boston New York Philadelphia

Keep Refrigerating Systems on the Job *with* BRISTOL'S

TRADE MARK REG. U. S. PAT. OFFICE

Cooling and refrigerating systems, both large and small, require constant checking to maintain efficient operating conditions.

Installed at important locations in the system, Bristol's Recording Instruments immediately show when wrong tendencies occur and enable you to quickly locate the trouble. They are a direct means of protection against faulty conditions.

The simplicity and ruggedness of construction permit these instruments to give many years of constant service without repairs or adjustments.

Our engineers can show you where Bristol's may be used to good advantage.

The Bristol Company *Waterbury, Connecticut*

FOR 36 YEARS — Ask Any Technical Engineer — MAKERS OF

BRISTOL'S RECORDING INSTRUMENTS

GORTON SYSTEM

(*Single Pipe*)

VAPOR HEATING
Means

25% Saving, installation cost, over other vapor heating systems.

25% Saving, coal consumption, over steam heating.

Automatic regulation.

Room temperature easily controlled with the *Gorton Quarter Turn Valve.*

Quick heating up at all times.

High grade specialties lasting as long as the building.

Have you talked these advantages to your customers?

Send for new complete catalog and Heating Handbook

Gorton & Lidgerwood Co.

96 Liberty Street, New York, N. Y.

Established 1887 **Representatives in Principal Cities**

Why do nationally known companies select Midwest after having tried out less efficient Air Filters over a period of time?

Midwest Air Filter Unit
(Cell and Frame) Type U2.

Because Midwest Air Filters Are of Scientifically Correct Construction

1. In a Midwest Filter unit 94% of the front area is effective filter area, which is 19% more than in any other filter unit of the standard size of 20″ x 20″.

2. Midwest Filters have a baffle filter medium of pronounced, progressive density, sufficiently open in front to accumulate large quantities of dirt, but close and dense enough in the rear to catch even the finest dust particles.

This construction results in:—

Highest cleaning efficiency
Lowest operating resistance, and
Largest dust accumulating capacity.

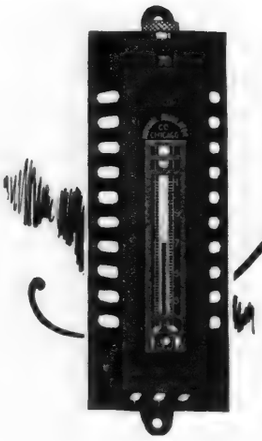
Midwest Filters have a lower rise in resistance and require less cleaning than any other filter on the market.

Some of the Nationally Known Companies Who Have Selected Midwest

Ford Motor Company.....Detroit, Mich.
Union Electric Light & Power Co., St. Louis, Mo.
New York Telephone Co.....New York City
W. L. Fleischman Yeast Co., Chicago & New York
International Paper Co.....New York City
Boston Elevated Railroad Co....Boston, Mass.
Union Gas & Electric Co.....Cincinnati, Ohio
General Electric Co.....Schenectady, N. Y.
National Biscuit Company.....New York City
Youngstown Sheet & Tube Co....Youngstown, Ohio, & Indiana Harbor, Indiana

MIDWEST AIR FILTERS
INCORPORATED

BRADFORD, PA. OFFICES IN PRINCIPAL CITIES



National Regulation

Investigate!

ANY one of many thousands of National installations will prove to you not only the merits of temperature control but the Superiority of National Regulation.

Any one or all of these installations are open to your investigation. The names and data are yours for the asking. The more thorough the investigation the surer your decision to specify

THE NATIONAL SYSTEM
AUTOMATIC TEMPERATURE CONTROL

In a "Personal Service" letter to Architects and Engineers we give detailed information on the relative efficiency and economy of Positive Action and Graduated Action Systems of Temperature Regulation. This letter is sent only upon request—on your business letterhead.

NATIONAL REGULATOR CO.
2301 KNOX AVENUE CHICAGO

CORRECTLY DESIGNED
Cast Iron Blow Off Basins
also
APPROVED GARAGE BASIN EQUIPMENT

INLAND IRON WORKS
99-111 McDonough Street JOLIET, ILL.

AUTOMATIC
HEAT REGULATION
ELECTRICALLY OPERATED

Packless Electric Valve

Whether it be for an isolated room or complete building, Gold's Control will give you that desired equable temperature. Energy derived from the 110 volt lighting current.

Write for General Catalog with Testimonials

Thermostat

GOLD CAR HEATING & LIGHTING CO.
BUSH TERMINAL
220 36th STREET BROOKLYN, N. Y.

Service *The* *Satisfaction*

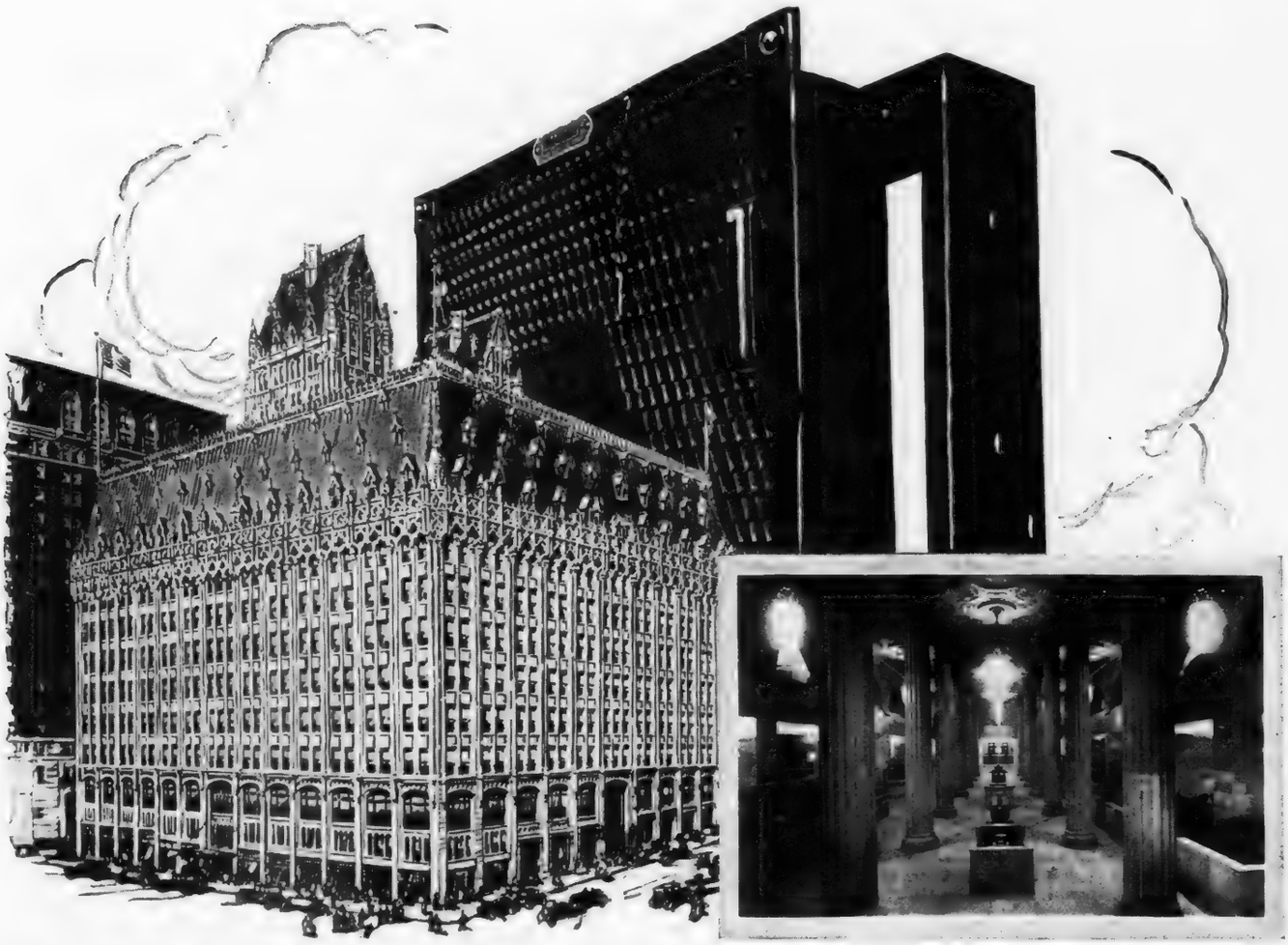
VECO SYSTEM of VAPOR HEATING

Is the result of 21 Years of Specialization in Vapor Heating
ounces pressure — modulation — perfect regulation.

VAPOR ENGINEERING COMPANY

PHILADELPHIA—10 So. 18th Street
J. Wilbur Glassey—M. S. Buck

NEW YORK—489 Fifth Avenue
Chas. E. Scott—R. C. Willis



Reed *Clean* Air *for* UNION TRUST

WHEN a trust company makes an investment, the element of uncertainty must be entirely removed. That's why the Union Trust Company of Pittsburgh chose Reed Air Filters for its air-cleaning requirements.

Long, satisfactory use by many of the world's greatest industries and institutions have proven that Reed equipment combines permanently high cleaning efficiency with permanently low operating cost. Whatever your requirements may be, send first for the Reed Blue Book which tells the whole story and list of 153 nationally-known companies in widely diversified fields who have recently *reordered Reed.*

REED AIR FILTER COMPANY, *Incorporated*, 215 Central Ave., Louisville, Kentucky
Offices in Principal Cities

New
CONTINUOUS
FILTER
Added to Reed Line

No moving parts—nothing to wear out. "Streamline" filter media used for minimum resistance to air flow and highest capacity per unit. Cleans and charges automatically. Minimum space—minimum cost. Units interchangeable. Highest cleaning efficiency. *Write for details.*

Reed Air

TRADE MARK

filters ALL *METAL*

Use This

REED AIR FILTER CO., *Incorporated*
215 Central Ave., Louisville, Kentucky

Send, without obligating me, a copy of the Reed Blue Book, etc. ☐ Also particulars about the Reed Continuous Filter ☐

Name..... City..... Possible Use.....

Company..... State.....

THE BELVEDERE APARTMENTS—CINCINNATI, OHIO.
Architect—C. H. Ferber. Consulting Engineer—Carl J. Kiefer.
Plumbing Contractor—Richard Murphy Plumbing Co.

"—and we always have plenty of hot water."

How often you hear apartment house tenants use some such statement as a distinct point in favor of their apartments.

Owners realize that a service which enters so strongly into a tenant's judgment of an apartment cannot be overlooked.

Architects and engineers who have once specified Whitlock Heaters for an apartment ("The Belvedere" shown is a fine example) are glad to have owners look up this feature of their other apartment jobs. In fact, they say whatever the problem, if it is

"Hot Water?—Let Whitlock Do It."

WHITLOCK HEAT TRANSFER PRODUCTS

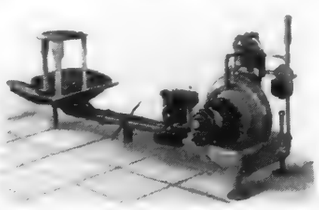
THE WHITLOCK COIL PIPE COMPANY

40 South St., Hartford, Conn.

New York, Boston, Philadelphia, Chicago, Baltimore Pittsburgh, San Francisco, Cincinnati, Detroit, and other principal cities. Consult telephone book.

The CHALMERS OIL BURNER

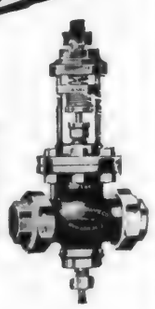
was among the pioneers in the oil burner industry and their present popularity is based on the permanent, satisfactory service they have delivered through the years.



Approved by Underwriters Laboratories. Responsible Representatives will find the Chalmers Agency a profitable one.

CHALMERS OIL BURNER CO.
Minneapolis, Minn.
Member American Oil Burner Association.

Do Heating and Ventilating Engineers Know WHY One ATLAS sells another?



High quality, yet surprisingly low price. Quantity production makes it possible.

See classified index for our complete line of regulating valves.

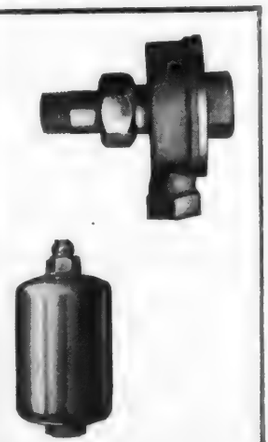
ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South St., Newark, N. J.

A Dependable Line of Heating Specialties

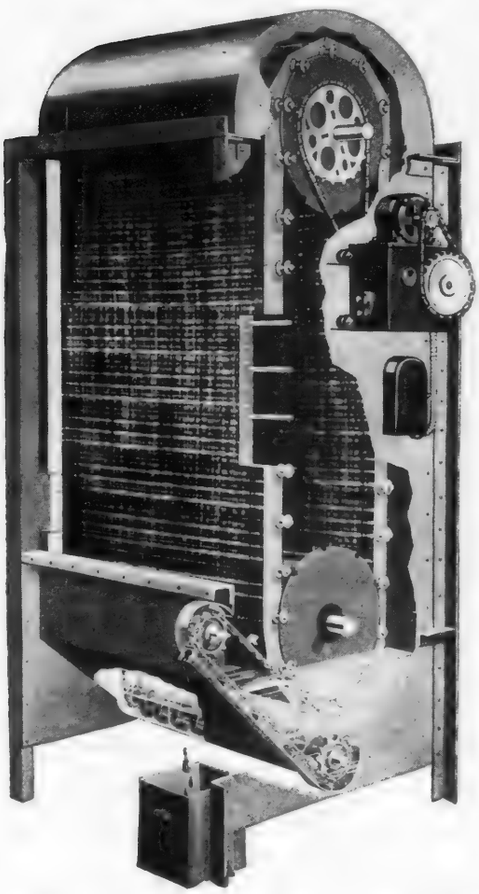
Stay-Rite Heating Specialties are dependable because they are made right and in strict accordance with heating requirements. They have long since passed the experimental stage. And over many heating seasons they have justified the confidence of their owners and proved the high efficiency of the Stay-Rite Line.

Write for literature and prices

The Ideal Heating Equipment Co.
1250 West 4th Street CLEVELAND, OHIO



We complement the Phoenix
by acquiring the National Rotary



Phoenix Automatic Constant-Effect Air Filter, with Automatic Sediment Ejector

IN ORDER to establish a complete and comprehensive Air Filtration Service, by providing our staff of Engineers with perfected mechanical equipment adaptable to any requirement—whether industrial or public building—we have acquired the National Rotary Air Filter, a highly developed entirely automatic filter, evolved more than five years ago and second only to our own original **Phoenix** *Constant-Effect* Air Filter as a pioneer in this field.

To both of these Filters we have added the most advanced improvement since the inception of the Automatic Filter—an entirely automatic Sediment Ejector, completely eliminating the "human element."

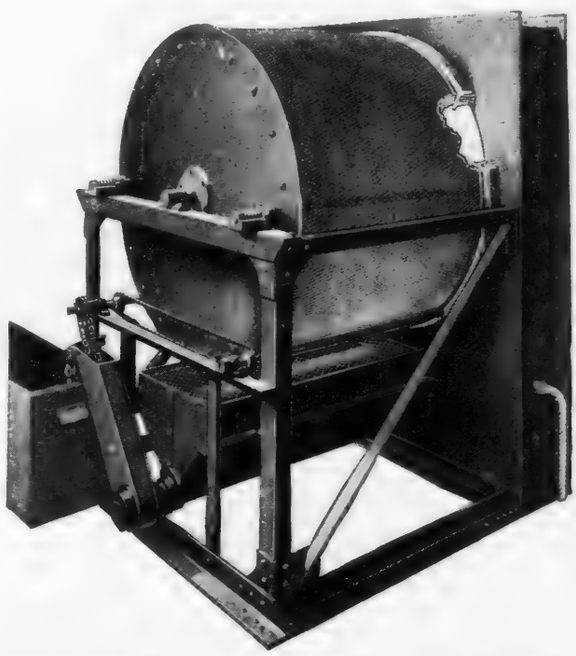
Thus the Air Filtration Service of Drying Systems, Inc., affords to Architects, Engineers and Owners the experience of the pioneer Engineers in this field, and two distinct types of Automatic Air Filters, one or the other of which will effectively meet any requirement.

Complete Data upon request

DRYING SYSTEMS, INC.
DRY-SYS
Drying and Air Conditioning Equipment
1800 Foster Avenue, Chicago

50 Church Street New York	2011 Park Avenue Detroit	Rialto Building San Francisco

Offices in Principal Cities—Consult Telephone Directory



National Rotary Air Filter, with Automatic Sediment Ejector

The Guests Enjoy Sarco Comfort here

Allerton Hotel
New York
Murgatroyd
& Ogden,
Architects.

When this imposing and beautiful hotel was still a few lines on the drawing board, the engineers and architects were planning far ahead for the comfort of its guests.

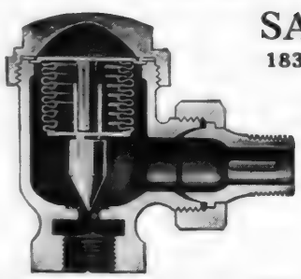
The items of construction were so carefully selected that the very efficiency of their operation would keep them from the guests' attention.

Probably few of the guests ever noticed any of the 530 Sarco Radiator Traps with which the building is equipped. But that's why these traps were selected. Silent in operation, preventing water hammer, never freezing or air binding, self-cleaning—it is no wonder the guests never notice them.

When you are planning *your* next building, remember that the installation of Sarco Radiator Traps will be a lasting testimonial to your good judgment, in providing maximum comfort and satisfaction.

Sarco Radiator Traps' many advantages over ordinary traps are described in Booklet P-134. Tell us we may send you a copy.

SARCO Radiator Traps



SARCO CO., Inc.
183 Madison Ave., New York

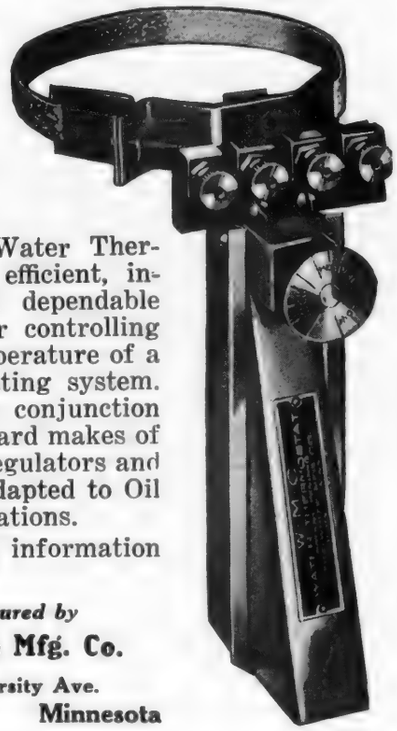
Boston Cleveland
Buffalo Detroit
Chicago Philadelphia

Peacock Bros., Ltd., Montreal

W-M-C Water Thermostat

For Dual Control

Clamps on the Riser



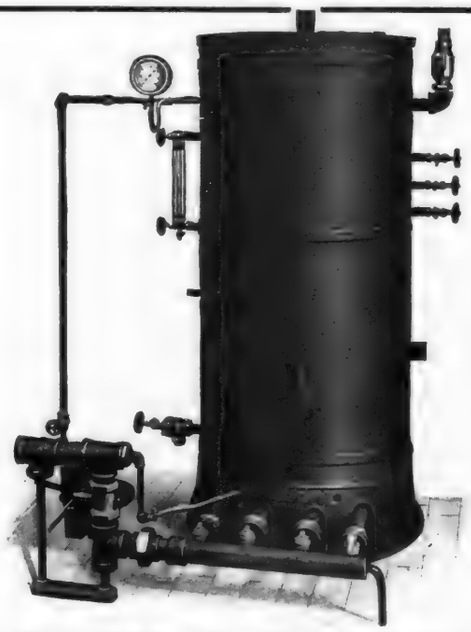
The W-M-C Water Thermostat is an efficient, inexpensive and dependable instrument for controlling the water temperature of a hot water heating system. It operates in conjunction with the standard makes of electric heat regulators and is especially adapted to Oil Burner installations.

Write for full information and prices.

Manufactured by

The White Mfg. Co.

2362 University Ave.
St. Paul, Minnesota



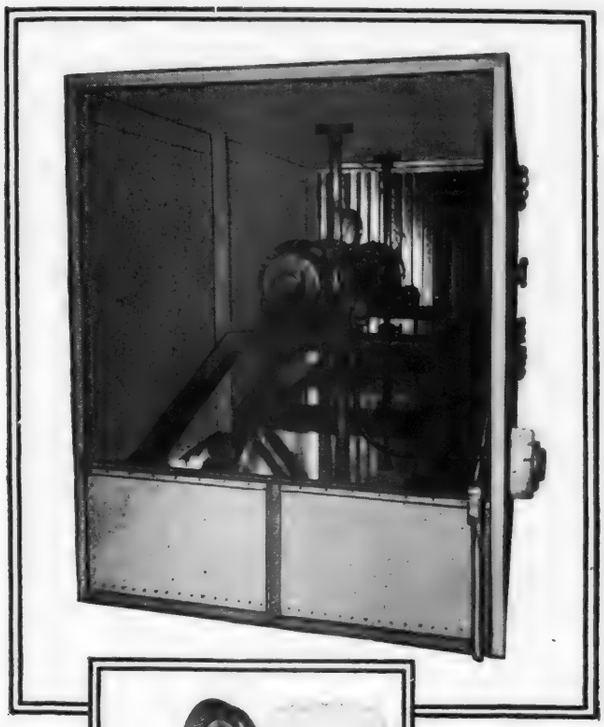
KANE Gas Fired Automatic Steam Boiler
Highest Efficiency

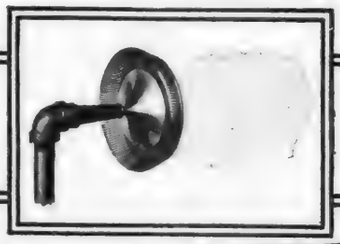
The first KANE Gas Fired Steam Boiler was manufactured over twenty five years ago and since that time over 5600 have been installed in this and other countries.

KANE boilers are rendering efficient and valuable service to their satisfied owners and can be identified with every branch of industry where steam, at high or low pressure is required for industrial or domestic purposes. *Send for descriptive literature.*

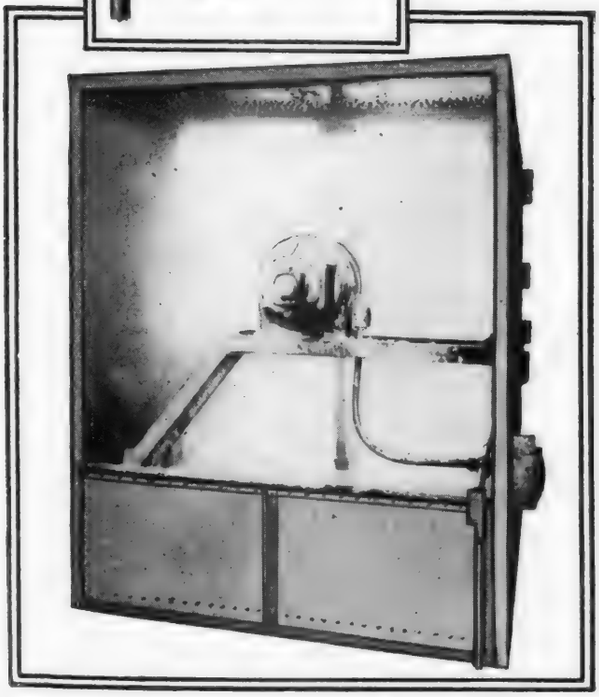
Monarch Sales & Engineering Co.
Formerly Ofeldt Gas Boiler Sales Corp.
363 W. Erie St., Chicago, Ill.
2010 Locust Street, St. Louis, Mo.
Southern Industrial Engr. Co.
American Trust Bldg., Birmingham, Ala.

The Bayley Turbo Air Washer





The Bayley Turbo Atomizer, the heart of the Bayley Turbo Air Washer



Top cut shows the Bayley Turbo Air Washer at rest; note simplicity and accessibility of construction. Lower cut shows the washer in action—the water is churned centrifugally by the Turbo Atomizer into a dense, even spray with no possibility of clogged nozzles.

WILL NOT CLOG!

The trouble caused by clogging nozzles—so common to air washers of the multiple spray, small orifice type—is eliminated by the Bayley Turbo Atomizer with its large orifice fire type nozzle.

Just compare the area of the head of your pencil with the area of a silver twenty-five cent piece and you have some idea of the relative size of the orifices of the spray nozzles of the two types of air washers —the area of the smallest orifice used in the Turbo Air Washer is just 26.45 times the area of the orifice of the nozzle used in the multiple spray washer. In the Turbo Washer, the water is atomized by centrifugal force and not high pressure. Thus, a saving of from 40 to 60% of the power required for efficient operation is saved.

The addition of this power saving and the saving of the labor required to clean small orifice nozzles results in a total saving in operating cost which is well worth the consideration of concerns and institutions who contemplate the installation of air washing equipment.

Non-clogging and economical in operation —these are features that make the Bayley the most efficient air washer available today. Write for Bulletin No. 25 giving the complete facts.

BAYLEY MANUFACTURING CO.

742 Greenbush St., Milwaukee, Wis.

Branch Offices:

New York — Suite 503 — 30 Church St.

Buffalo, N. Y.—333 Jackson Bldg.

Pittsburgh, Pa.—Leiendecker Bros., Fulton Bldg., 2nd Floor.

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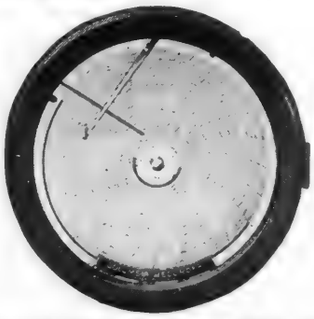
Bayley
AIR ENGINEERING & EQUIPMENT
HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS — PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS

Buy Your Recording Gauges from a Gauge Maker

When you want a suit of clothes you go to a tailor—not to a dressmaker. In medicine and law you go to a *specialist* when you want to be sure, because you know that practice along one line makes for perfection in that line.

For 76 years our skilled workmen have specialized in the manufacture of gauges. Isn't it natural that this concentration should result in producing better, more reliable gauges?



AMERICAN RECORDING GAUGES

are built throughout with parts designed specially for Recording Gauges. For illustration, they have *Bourdon* springs, the same as used in our Indicating Gauges, instead of with a *make-shift* spring designed for a different type of instrument.

Therefore American Recording Gauges are extremely lively, and more simple, rugged and durable. There are no fine capillary connecting tubes to the socket.

The many exclusive features of American Recording Gauges are explained in our Catalog E-14. Send for a copy.

AMERICAN SCHAEFFER & BUDENBERG CORP.
Brooklyn, N. Y.

Atlanta	Cleveland	Philadelphia	*Seattle
*Boston	Detroit	*Pittsburgh	St. Louis
Buffalo	*Los Angeles	Salt Lake City	Tulsa
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*Stock carried at these branches.

Direct Factory Representatives for Eastern Canada:
Mechanical Equipment Co., 807 New Birks Building, Montreal.
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BOOKS ON HEATING AND VENTILATING

THE DESIGN OF GRAVITY-CIRCULATION WATER HEATING SYSTEMS. By F. E. Giesecke, Ph. D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the entire water heating section of the A. S. H. & V. E. Compendium of Modern Practice has been discarded and replaced with a new section by Dr. Giesecke, embodying the methods here presented in detail. 64 pages of text and 10 pages of tables and charts. Price, $3.00.

PLUMBERS' HANDBOOK. By Samuel E. Dibble. This work contains valuable data for the heating engineer and estimator, architect, building contractor and sheet metal worker, as well as for the plumber. Each subject is treated by a specialist, the section on Pipe Standards and Pipe Dies by F. N. Speller and that on Heating by Alphonse A. Adler. Size 4 x 7 in. 629 pp. 316 ills. Cloth, $4.00.

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STEAM POWER PLANTS: Their Design and Construction. By Henry C. Meyer, Jr., M. E. Third edition, fully revised. One of the standard works on the design and construction of power plants. Covers proportioning boilers, selection and writing specifications for steam engines, selection and arrangement of auxiliaries, construction of chimneys, coal handling, etc. 219 pages. Size 6 x 9 in. Illustrated with folding plates. Price, $2.00 postpaid.

PRACTICAL STEAM, HOT WATER HEATING AND VENTILATION. By Alfred G. King. Containing 396 illustrations. The book is a working manual for heating contractors, journeymen, steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $4.00.

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HOUSE HEATING WITH OIL FUEL. Presents in concise form the meat of the available information on the various phases of the problem of oil burners as a source of heat for homes. By P. E. Fansler, E.E., Associate Editor, The Heating and Ventilating Magazine. Second edition, 63 pages, with charts and illustrations. Price $1.00.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS. By James D. Hoffman. Fourth edition of this important work entirely rewritten and reset. A standard manual covering theory and practice, with special chapters on heat losses, furnace heating, water and steam heating, mechanical vacuum heating, mechanical warm-air heating, temperature control, electrical heating and refrigeration. With appendix of 75 tables. Size 4½ x 6¾ in. Pp. 478. Price $4.50 postpaid.

HANDBOOK OF THE NATIONAL DISTRICT HEATING ASSOCIATION. Devoted to data on all phases of Central Station heating work, including generation, distribution, utilization, meters and water heating, compiled by the Association's Educational Committee. All new and revised data for this book will be supplied free for five years. Bound in leather, with six-ring binder. Price $5.00, postpaid.

THE HEATING and VENTILATING MAGAZINE
1123 BROADWAY, NEW YORK

This diagram shows the hook-up of Mercoid Control with one type of Unit Heater where motor is less than one horsepower.

Mercoid Controls make Unit Heaters automatic

Manufacturers approve this new application of famous Mercoid principle

WITH this control, room temperature can be maintained constantly at the correct degree for most efficient work.

No one needs to watch the thermometer—open and close windows—start the fan or stop it.

If the temperature rises above a desired point, the fan stops—and automatically starts again when the temperature falls. By a simple adjustment, this control can be set to start and stop the fan at any desired temperature within its range. When desired, can be furnished to open and close the steam supply.

Mercoid Thermostats are regularly furnished with an adjustable range of 56° to 80°. Higher or lower temperatures can be supplied.

Contacts are enclosed. No open arc. No corrosion.

The installation above is used with motors of less than one horsepower. For motors of one horsepower or over, an automatic across-the-line starting switch is required. Mercoid Thermostats will carry line current, either D. C. or A. C., 25-60 cycle, 110 or 220 volts.

Write for Mercoid Folder No. 845.

We have been advised of the approval of Mercoid Controls by the following manufacturers of Unit Heaters:

American Blower Co.
Detroit, Mich.

Autovent Fan & Blower Co.
Chicago, Ill.

Buffalo Forge Co.
Buffalo, N. Y.

Dwyer Equipment Co.
Chicago, Ill.

Ilg Electric Ventilating Co.
Chicago, Ill.

Modine Mfg. Co.
Racine, Wis.

New York Blower Co.
Chicago, Ill.

Pecco, Inc.
St. Louis, Mo.

Skinner Brothers Mfg. Co.
St. Louis, Mo.

B. F. Sturtevant Co.
Hyde Park, Boston, Mass.

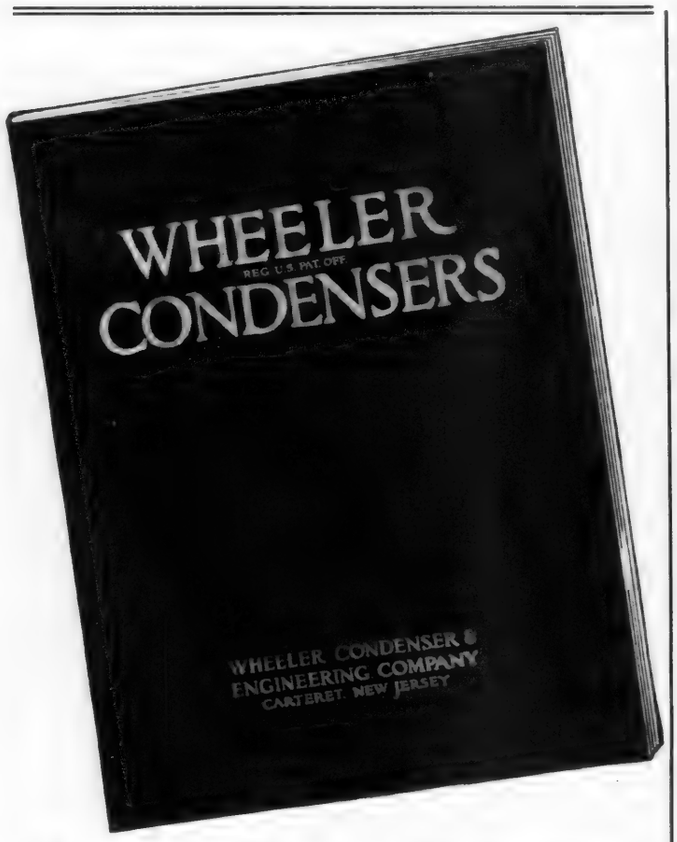
York Heating & Vent. Co.
Philadelphia, Pa.

L. J. Wing Mfg. Co.
New York City

AMERICAN RADIATOR COMPANY

Specialties Department

816 So. Michigan Ave. Chicago, Ill.



Recent Developments in Condenser Design

THE modern surface condenser is no longer a simple box of tubes. If high efficiency is to be obtained in large units, special attention must be paid to flow conditions on both the steam and water side of the tubes. Steam must penetrate to all parts of the condenser to avoid idle tube surface.

Unused tubes, in addition to adding to the size and first cost of the unit, increase the running costs, as the water pumped through them performs no useful work. Although a surface condenser may be designed with a low coefficient of heat transfer to meet unfavorable operating conditions such as foul tubes, it should be capable of showing a high heat transfer coefficient, approaching that of a single tube condenser in pure steam, when tested under favorable operating conditions. The new Wheeler Condenser Catalog describes the means whereby condenser performance is improved. A new design is shown in which the kinetic energy of the steam leaving the turbine blades is used to secure steam penetration throughout the condenser and to sweep out the non-condensible gases.

We have endeavored to make the new Wheeler Condenser Catalog of service not only to the prospective purchaser of condensers, but also to the user of condensers. Comprehensive treatment has therefore been given to the Care and Upkeep of Condensers, Condenser Tube Corrosion and its Prevention, Preferred Methods of Circulating and Hotwell Pump Operation whereby the power consumed by these units can be decreased, and other interesting items.

The practices recommended in the catalog represent the latest developments, and much of the material has never before been published either in the trade press or in technical books. Ask for Catalog H-118.

WHEELER CONDENSER & ENGINEERING CO.
149 Broadway, New York
Works - CARTERET, N.J., NEWBURGH, N.Y.

65

Equally Dependable

for STEAM, WATER, GAS, OIL or AIR

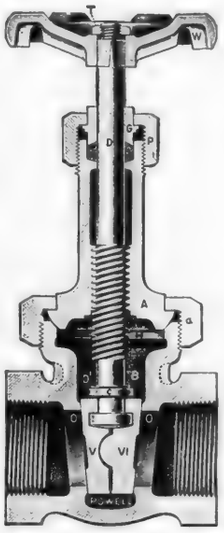


Fig. 375

POWELL White Star Gate Valves

Double Wedge Powellium Nickel Discs.

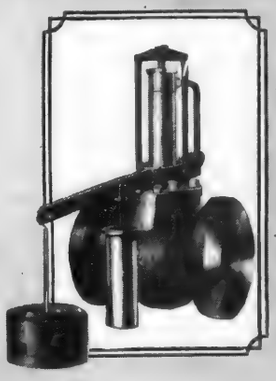
Union Bonnet.

For 200 pounds, Extra heavy for 300 pounds W.S.P.

Order from your dealer
Write us for information

THE WM. POWELL CO.
Dependable Engineering Appliances
CINCINNATI OHIO

VALVE MAKERS FOR OVER FIFTY YEARS



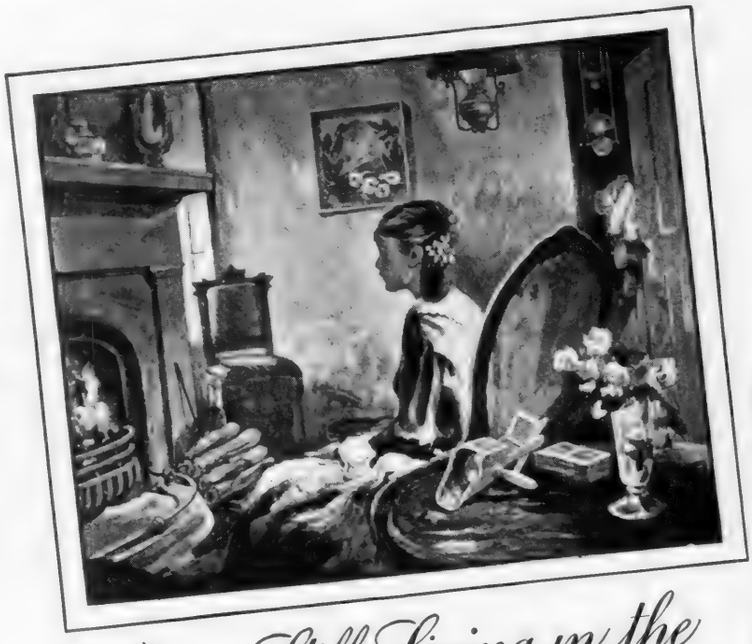
THE DESIGN of the Davis Pressure Regulator is based upon full knowledge of all the requirements of modern generation and use of steam.

Wherever boiler pressure must be reduced to the correct service pressure for auxiliaries, heating, and process uses of steam, Davis Regulators maintain the exact lower pressure automatically under all conditions of operation.

The Davis Regulator is sensitive and accurate, and is not affected by high velocity steam. Pressure is counterbalanced by weight, and the action of the regulator is visible. The engineer can test a Davis Regulator by hand as often as he likes. Send for the Davis catalogue and get all the details.

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1875

G. M. DAVIS REGULATOR CO., 422 Milwaukee Avenue, Chicago, Ill.



Are You Still Living in the Early 80's?

To go back to living standards of the eighties is unthinkable in this day of modern conveniences. And yet in some homes, hand regulation of the heating plant, obsolete since the middle eighties, still is tolerated.

What is the reason? In most cases, simply lack of understanding. Every family wants the comfort of uniform temperature—the happiness of healthful heating—freedom from looking after the heating plant—the fuel saving that results from Minneapolis automatic heat regulation.

These priceless advantages of the Minneapolis are now enjoyed by more than two million people. The Minneapolis starts their day off right — with cheery warmth, provided by clock-control which automatically raises the temperature early in the morning. All day long—temperature at just the degree you find most comfortable. At night — automatic lowering of the temperature by means of the clock. Nobody ever touches dampers, drafts, or valves. What a vast change from hand regulation!

For Any Heating Plant, Any Fuel

Warm air, hot water, steam, vapor — coal, coke, gas, oil — the Minneapolis is for all of them. You need not question reliability — since 1885 the Minneapolis has proved that. If you are purchasing an oil or gas heating system with automatic controls included, ask if it is Minneapolis-equipped. Take this precaution for your own protection, remembering that more Minneapolis Heat Regulators have been sold than all other makes combined. Mail the coupon for free booklet.

The Minneapolis Heat Regulator is sold and installed by a nation-wide organization with branch offices in principal cities and experienced dealers in almost every community. Branch and distributing offices: New York, Chicago, Philadelphia, Boston, Detroit, Cleveland, St. Louis, Cincinnati, Milwaukee, Pittsburgh, Baltimore, Washington, D.C., Buffalo, Syracuse, St. Paul, Kansas City, Omaha, Denver, Portland, Ore., Seattle, and Hartford, Connecticut.

The "MINNEAPOLIS" HEAT REGULATOR for COAL—GAS—OIL

MINNEAPOLIS HEAT REGULATOR CO., Est. 1885
00 Fourth Ave., So., Minneapolis, Minn.

Please send me your free booklet, "The Proper Operation of the Home Heating Plant," and full information on the subject of automatic heat control. I have checked the kind of fuel I am now using or have under consideration.

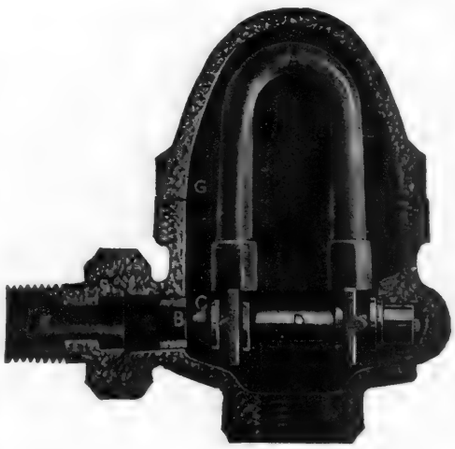
☐ Coal ☐ Oil ☐ Gas ☐ Coke ☐ District Steam

Name .....

Address .....

City ..... State .....

The Minneapolis Heat Regulator advertisement reproduced here marks the beginning of a new series of unusual interest to appear in the general magazines—a full page in The Saturday Evening Post, House Beautiful and House and Garden in August, and 2/3 page in the American Magazine in October. Total circulation of this advertisement, 4,801,610 (reaching approximately 20 million people).



The Perfect Automatic Valve for Vacuum or Vapor Heating

"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

Send for booklet

WILLIAM S. HAINES & CO.

12th & Buttonwood Streets

PHILADELPHIA, - - PA.

VENTO

Little Giant Radiator Hangers

One bolt, adjustable hangers, for wall-hung radiation, that are distinctly superior in workmanship and materials.

Little Giant Radiator Hangers are made for use on wall and double wall radiation, and for 1, 2, 3, and 4 column radiation, as well as the Corto, Aero and Capitol Radiator. They are so constructed that they will stand any stress or strain.

The Hanger plate is made of Boiler Plate Steel. The Foot Piece and Back Plate are of malleable iron cast in one piece. No cast iron is used.

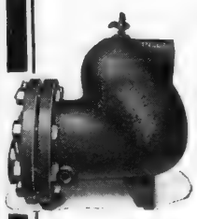
Little Giant Hangers allow for both vertical and horizontal adjustment. They hang with but one anchor bolt and are not visible after being installed.

Distributed by United States Radiator Corporation

Sold by all Leading Jobbers

Little Giant Mfg. Company

1927-31 Nicollet Ave., Minneapolis, Minn.



—a 2-year guarantee against repairs

You run no risk as to error in judgment when you buy Paracoil Steam Traps—for they are sold with a 2-year guarantee against repairs.

No repairs for 2 years—4 years—many years—is industry's experience with Paracoils.

Many of industry's largest and most discriminating buyers have switched to Paracoil Traps and are repeating their orders again and again. A trial in your plant will make you a regular Paracoil user, too.

Write for Catalog A-12

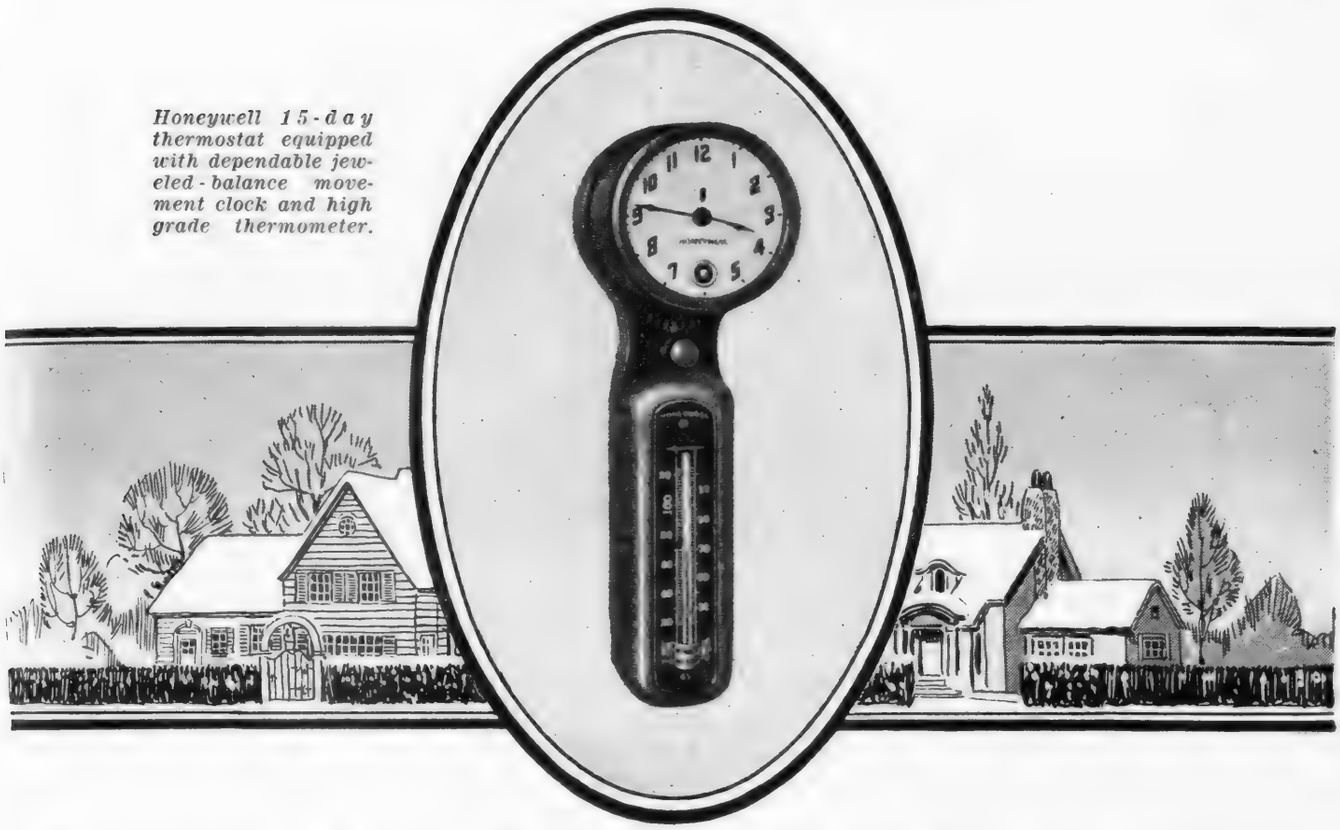
DAVIS ENGINEERING CORP.

90 West St. New York

Factory: ELIZABETH, N. J.

Paracoil

STEAM TRAP



Honeywell 15-day thermostat equipped with dependable jeweled-balance movement clock and high grade thermometer.

Prepare Now For a Profitable Autumn

THERE is a genuine demand for HONEYWELL temperature regulators.

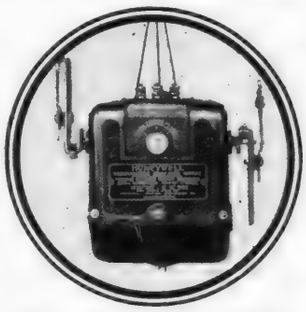
Householders everywhere are ready to enjoy the greater comfort and convenience of HONEYWELL.

They realize that manual regulation is obsolete, antiquated. Automatic temperature regulation for the home was never so salable as it is today.

This is especially so of HONEYWELL, because of its reputation for continuous dependability and unvarying accuracy.

Here is a ready-made market for you. Other dealers are taking advantage of it. The leading manufacturers of heating boilers recommend HONEYWELL exclusively; and of the important automatically controlled domestic oil burners listed as standard by Underwriters' Laboratories, Inc., a majority is equipped with HONEYWELL.

It will profit you to avail yourself of this market. Cultivate it. Follow up your prospects consistently during these summer months, stressing the benefits to be derived from positive automatic control—and you may anticipate a more substantial fall and winter business.



The Honeywell electric regulator motor—an amazing achievement in utter simplicity.

The complete HONEYWELL System of Automatic Control will contribute in no small degree to the more satisfactory operation of your installations. It will bring to your product a new measure of efficiency, economy, comfort and safety.

THE HONEYWELL HEATING SPECIALTIES CO., WABASH, INDIANA

HONEYWELL

Temperature Regulators

Overhaul your customers' heating plants

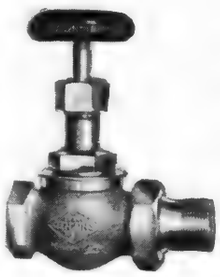


Fig. 167
Jenkins Bronze Radiator Globe Valve, with male union.

Fig. 168
Jenkins Bronze Radiator Angle Valve with male union.

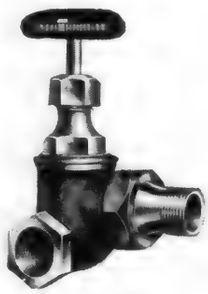


Fig. 180
Jenkins Right Hand Radiator Corner Valve, offset pattern, with male union.

Now is the time to do it.

Go over heating systems carefully and, whether the owner decides to keep much the same system or to install a new one, you will find that valves are needed.

Jenkins valves, by giving ever-reliable service on radiators and in all piping systems, are real aids to keeping heating at its best.

They promote comfort and convenience. The extra sturdiness built into every genuine Jenkins "Diamond" marked valve is your protection against any possible blame for faulty valve performance.

JENKINS BROS.

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JENKINS BROS., LIMITED
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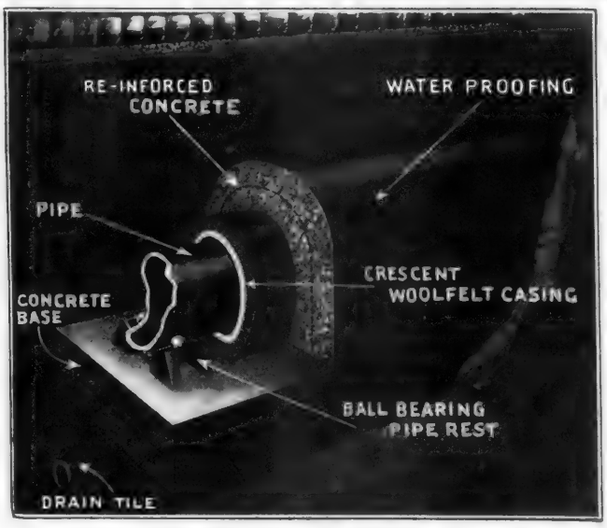
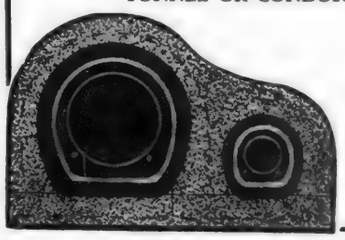
Always marked with the "Diamond"
Jenkins Valves
SINCE 1864



THE CRESCENT SYSTEM

Dirt-Proof Ball Bearings, and Air Space Around Pipe, Permits Rotation of the Pipe, Adding Years to its Life.

Manufacturers and Contractors of
UNDERGROUND STEAM DISTRIBUTING SYSTEMS
TUNNEL OR CONDUIT CONSTRUCTION



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W. H. PEARCE & CO.
115 S. Dearborn Street
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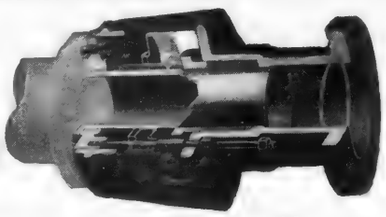
Catalog on Request

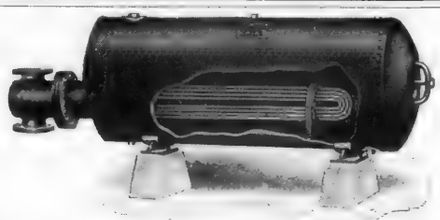
ROSS
Crosshead-GUIDED Expansion Joint Excels in



Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.

New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.



O. E. F. U-Tube and Straight Tube heaters of flange steel make for durability—recognized by leading heating engineers.

Our engineering department is at your service and will assist you in selecting the proper sizes for various types of buildings.

O. E. Frank Heater & Engineering Co., Inc.
Factory and Offices at Buffalo, N. Y.

"THEY KEEP A-RUNNING"

3 Horse Power Century Repulsion-start Induction Single-phase Motor

QUIET OPERATION

Century Repulsion-start Induction Single-phase Motors "Keep a-Running" quietly. This is only one outstanding Century feature—based on 23 years of Single-phase Motor design—and accounts for the wide use of type RS motors in home applications such as household refrigerators, oil burners and house pumps.

1. There are practically no brush friction noises, because the brushes actually touch the commutator only during the starting period.
2. After acceleration, brushes are positively and automatically released from the commutator, and the motor then runs as an induction motor.
3. Armatures are given an individual running balance test during which vibration is practically eliminated.
4. There is little or no radio "interference," since in most classes of service the brushes are in contact with the commutator only 1/900th part of the time the motor is operating.

Note: The Century **Wool-yarn** System of Lubrication—**in which only continuous unbroken strands of pure wool yarn are used**—is standard equipment on all motors one horse power and smaller. This system assures at least one year's continuous 24-hour-per-day operation without reoiling.

Century Repulsion-start Induction Single-phase Motors are built in all standard sizes from 1/8 to 40 horse power. Temperature rise not more than 40° Centigrade.

There is a difference—use and specify Century Repulsion-start Induction Single-phase Motors.

CENTURY ELECTRIC COMPANY

1806 Pine St. **St. Louis, Mo.**

29 Stock Points in the United States and More Than 50 Outside.

1/8 to 40 H.P. Century MOTORS 1/8 to 40 H.P.

MAINTAINING A STANDARD

COMMONWEALTH Lavigne Radiator Valves have never been made to sell on a price basis; nor have we ever deviated from our high standards of manufacture in order to meet price fluctuations. As a result, the quality has always remained constant and Commonwealth Lavigne Radiator Valves have maintained an enviable record for unvarying satisfactory performance under all service conditions.

Today, as in the past, steamfitters who are jealous of their own reputation for good work are buying Commonwealth Lavigne Radiator Valves on merit alone—because they are not offered as bargain counter merchandise, but as a tried and proven product on which you can rely.

Commonwealth Brass Corporation
Detroit

No. 432 Steam Radiator Valve Corner Pattern

Graduated Packless Steam Radiator Valve

No. 202 Hot Water Radiator Valve

Your Jobber Can Supply You

LAVIGNE COMMONWEALTH

RADIATOR VALVES

How's Your Hot Water?

Mr. Graham said "that question can best be answered by the story of the boy who when asked if he had ever been troubled with indigestion (during an examination for life insurance) asked

What's That?

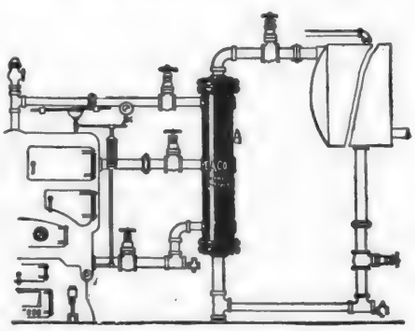
the boy had never heard of indigestion, that's the way it is with our hot water--never hear it mentioned about my house, it's always there, plenty of it, and clean, something we never had before"--Mr. Graham has a Taco heater attached to his heating boiler, and heats his domestic water that way.

It makes you feel good!

when a client, customer or as in this case a friend, take your recommendation and is so well pleased--Taco users are boosters every time--they make friends and keep them. There is a new addition to the Taco produces

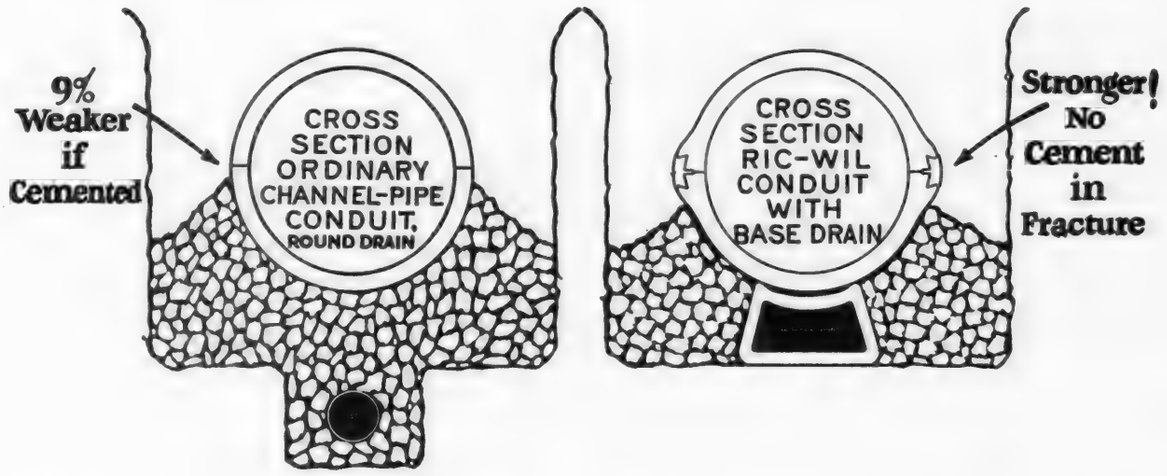
Taco Semi-Indirect

for use with a heating boiler burning oil, and all larger jobs whether using oil or coal. It is connected vertically to the boiler, so will circulate to low tanks, saving head room and at times making unnecessary piting the boiler. I has three connections to the heating boiler: one above with steam for quick heating; two below the water line, heating from the boiler water which reduce the boiler load by heating the water at night and other times when the boiler is not making steam and besides giving a dependable supply of hot water day and night it pays for its self in a surprisingly short time by the fuel it saves.



Installation Diagam

Thermal Appliance Company
342 Madison Ave., New York


9% Weaker if Cemented
CROSS SECTION ORDINARY CHANNEL-PIPE CONDUIT, ROUND DRAIN
CROSS SECTION RIC-WIL CONDUIT WITH BASE DRAIN
Stronger! No Cement in Fracture

Ric-wiL is both Watertight and Strong

NEARLY four months of tests recently completed, during which over 1000 ft. of tile conduit were tested, proved among other things that putting cement between the fractured edges of the split tile weakened the joints.

Ordinary channel pipe conduit lost 9% of its strength by this cementing, even under ideal laboratory conditions.

But in Ric-wiL Conduit the cement is used only as an outside lock and seal. The fractured edges of the split seat perfectly, being free of cement, and are held seated by the heavy cementing in the Loc-liP Joint.

The result is that Ric-wiL is absolutely water-tight and its extraordinary strength still further increased. Ric-wiL Conduit is 40% stronger than ordinary conduit with round drain, installed as shown above.

These comparative tests of Ric-wiL and ordinary tile conduit were made with the Ames Iowa College Standard Machine, senior size, under exact instructions from the college Engineering Department. Details on request.

Note how the joint is shaped so that the top and bottom halves of conduit are locked together and the cement itself locked in place.

This Loc-liP Joint is the only method so far devised for sealing and strengthening split tile conduit.

THE RIC-WIL COMPANY, CLEVELAND, OHIO

RIC-WIL
UNDERGROUND CONDUIT

This Will Be Another Airid Year!

TWO great forces are molding public opinion in favor of Airid Air Valves.

1 Millions of individual advertisements in national publications are telling owners that Airids will cure cold radiators. Our next campaign will cover every worthwhile prospect in the country.

2 Thousands upon thousands of Airid Valves are creating goodwill by performing satisfactorily on radiators. When Airid is placed on a radiator it makes an instantaneous difference in the comfort of the owner. He just can't help talking about it—and you.

This will be an Airid year—and this display carton in your shop will help you get your share of the business.

At your jobber or from our nearest branch.

Made and guaranteed by

AMERICAN RADIATOR COMPANY
Specialties Dept.
816 S. Michigan Ave., Chicago

Installations of Mouat System of Heating Steadily Increased

City Building, Logansport, Ind.

Another Building in Indiana Mouat Equipped

The efficiency of the Mouat System of Heating continues to attract considerable attention throughout the heating industry. The reaction to this is a steadily increasing demand on the part of the heating engineer in collaboration with architect and owner that Mouat System be installed.

One of the latest Mouat installations is that in the City Building at Logansport, Indiana.

The Mouat System is a two-pipe gravity vapor or atmospheric steam heating system, maintaining a pressure of 1 to 3 ounces. Rapid changes or extremes in temperature do not affect its efficiency. It is flexible and meets all demands in all types of buildings.

Let us send full information

VAPOR MOUAT HEAT

MOUAT VAPOR HEATING COMPANY
CLEVELAND, OHIO

VAPOR MOUAT HEAT

Hotter Water with Less Fuel—

The Reilly Water Heater

has the highest rate of heat transfer of any closed heater on the market. Besides its unequalled efficiency, several special features of construction make it the best heater for dependable year-in, year-out, service.

Every coil and joint of the Reilly Water Heater can be inspected and made tight *while under pressure and without breaking any pipe joint* —an exclusive Reilly Heater feature.

Expansion strains on headers or tubes are prevented by the spring-like crimped coils—another exclusive Reilly Heater feature.

Send the coupon for complete information

The Griscom-Russell Company

Dept. H, 285 Madison Ave., New York

Philadelphia	Chicago	St. Louis	San Francisco
Boston	Detroit	New Orleans	Los Angeles
Rochester	Cleveland	Dallas	Seattle
Pittsburgh	Milwaukee	Houston	Salt Lake City
Columbus	Minneapolis	Atlanta	Tulsa
Indianapolis	Kansas City	Charlotte	Denver

For Canada: Riley Engineering and Supply Co., Ltd., Toronto

NAME .....
COMPANY .....
ADDRESS .....

The Griscom-Russell Company,
Dept. H, 285 Madison Ave.,
New York.
Send me at once without charge copy of your bulletin describing the Reilly Water Heater.

H&VM-8-26

No. 5—This is the fifth of a series of advertisements listing Scott Valves

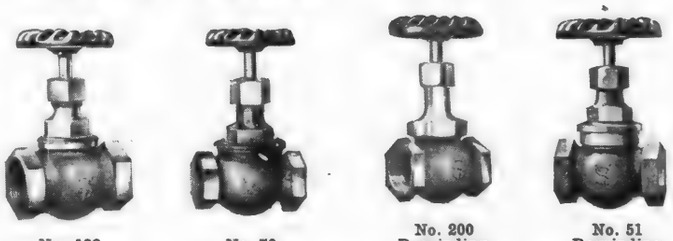
Scott Bronze Globe & Angle Valves

No. 192	—S.E.	Globe—Bronze Disc	125 lbs. S.W.P.
No. 193	—S.E.	Angle—Bronze Disc	125 lbs. S.W.P.
No. 70	—S.E.	Globe—Jenkins Disc	150 lbs. S.W.P.
No. 71	—S.E.	Angle—Jenkins Disc	150 lbs. S.W.P.
No. 72	—F.E.	Globe—Jenkins Disc	150 lbs. S.W.P.
No. 73	—F.E.	Angle—Jenkins Disc	150 lbs. S.W.P.
No. 200	—S.E.	Globe—U.B. Regrinding	200 lbs. S.W.P.
No. 201	—S.E.	Angle—U.B. Regrinding	200 lbs. S.W.P.
No. 202	—F.E.	Globe—U.B. Regrinding	200 lbs. S.W.P.
No. 203	—F.E.	Angle—U.B. Regrinding	200 lbs. S.W.P.
No. 249	—S.E.	Angle—U.B. Regrinding	250 lbs. S.W.P.
No. 250	—F.E.	Angle—U.B. Regrinding	250 lbs. S.W.P.
No. 251	—S.E.	Globe—U.B. Regrinding	250 lbs. S.W.P.
No. 252	—F.E.	Globe—U.B. Regrinding	250 lbs. S.W.P.
No. 49	—S.E.	Angle—Regrinding	250 lbs. S.W.P.
No. 50	—F.E.	Angle—Regrinding	250 lbs. S.W.P.
No. 51	—S.E.	Globe—Regrinding	250 lbs. S.W.P.
No. 52	—F.E.	Globe—Regrinding	250 lbs. S.W.P.

Scott Iron Body Globe & Angle Valves

No. 76	—S.E.	Globe—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 77	—F.E.	Globe—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 80	—S.E.	Angle—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 81	—F.E.	Angle—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 208	—S.E.	Globe—Regrinding Br. Disc	175 lbs. S.W.P.
No. 209	—F.E.	Globe—Regrinding Br. Disc	175 lbs. S.W.P.
No. 210	—S.E.	Angle—Regrinding Br. Disc	175 lbs. S.W.P.
No. 211	—F.E.	Angle—Regrinding Br. Disc	175 lbs. S.W.P.
No. 55	—S.E.	Angle—Regrinding Br. Disc	250 lbs. S.W.P.
No. 56	—F.E.	Angle—Regrinding Br. Disc	250 lbs. S.W.P.
No. 57	—S.E.	Globe—Regrinding Br. Disc	250 lbs. S.W.P.
No. 58	—F.E.	Globe—Regrinding Br. Disc	250 lbs. S.W.P.

There's a Scott Valve for every Service



No. 192 Standard Globe 125-lb. S.W.P. | No. 70 J.D.Type Globe 150-lb. S.W.P. | No. 200 Regrinding Globe 200-lb. S.W.P. | No. 51 Regrinding Globe 250-lb. S.W.P.

SCOTT VALVE MANUFACTURING COMPANY

DETROIT - - - MICHIGAN

Manufacturers of the Complete Line of

SCOTT SINCE 1886 VALVES

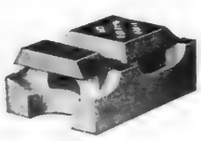
SIGN OF VALUE

"MAXIMUM SERVICE PER DOLLAR"

Investment of $675 Yields $1,866.71 Each Year

PYRAMID GRATES DID IT

Write for Details



PYRAMID IRON PRODUCTS CO.

136 Liberty Street New York City

CENTRAL STATION STEAM CO.

2912 East Woodbridge St.

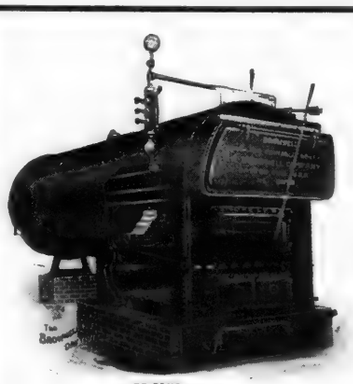
DETROIT, MICHIGAN

MANUFACTURERS OF

Cadillac Condensation Meters

Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.



Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL

Better Boilers for Heating and Power Purposes

70TH YEAR

of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.

BROWNELL Steel Heating Boilers are

LOW IN FIRST COST
HIGH IN EFFICIENCY
BUILT TO LAST A LIFETIME

Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.

THE BROWNELL CO.
DAYTON, OHIO

THE BROWNELL COMPANY — The World Over — SINCE 1855 — DAYTON, OHIO, U.S.A.

Established 1855

Send for Bulletins B6 B6A

BOILERS

Keeping them satisfied

Customers don't relish high bills. The "Master" Control Valve keeps down consumption of steam, keeps the temperature right, and gives you more steam to use elsewhere, without any extra cost.

Here's a record from the Congregational Church at Springfield, Ohio, covering a period of one week.

Average Outside Temp.	Average Inside Temp.	Total Steam Consumed Lbs.	Pounds used per degree of difference*
1924-5 44°	... (no control)	63,000	573
1925-6 34°	55° (controlled)	54,000	257

*Pounds used per degree of difference are obtained by dividing total quantity by the difference between 55° and 44°, in the first case; and 55° and 34°, in the second case.

The chart reproduced above covers 24-hour period. *No more steam was used* than was *actually needed*, to keep the temperature at 55°. The building was not *overheated* at any time.

You can serve more customers and serve them well, without increase of steam produced, by use of the "Master" Control Valve. This adds to your income and keeps all customers satisfied.

Let us tell you more about how to do this.

CENTRAL HEAT APPLIANCES

343 South Dearborn Street J. C. Hornung, Engineer **Chicago, Illinois**

(3433)

The Improved Nelson Gate Valves are ready

In Iron and Steel Body—screwed, flanged, and beveled ends for welding.

Non-rising stem and O.S. & Y. patterns.

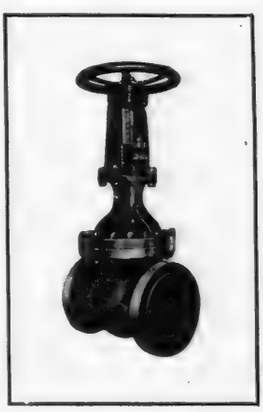
Guided by our 49 years experience in the manufacture of high standard steam specialties, we redesigned the Nelson Gate Valves to meet the exacting demands of the gate valve user.

The recognized high quality of Nelson Gate Valves is supplemented by new construction details for better gate valve service.

Modern and complete manufacturing facilities assure you of refinement in manufacturing as well as prompt shipping service.

Your copy of complete catalog No. 301, describing the Improved Nelson Gate Valve, will be sent as soon as you give us your correct address.

Jot it down on the corner of this ad and mail it to us.



AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

Offices: New York Chicago Seattle

Pin This Coupon To Your Letterhead

AMERICAN DISTRICT STEAM COMPANY North Tonawanda, N. Y.

Please send catalog No. 301 H describing the Improved Nelson Gate Valve.

Name .....

Address .....

Bought by Men Who Know

Certain men by education, training and natural bent are better fitted than other men to judge the value of hot water heaters.

The engineers of the American Locomotive Company are such men, because of their experience in building locomotives. And when this big concern needed hot water heaters for their enormous Schenectady plant they chose

Patterson
Hot Water Heaters

With all the expert knowledge of the American Locomotive Company at their command, would they have invested in a make of hot water heaters that they did not *know* to be the best?

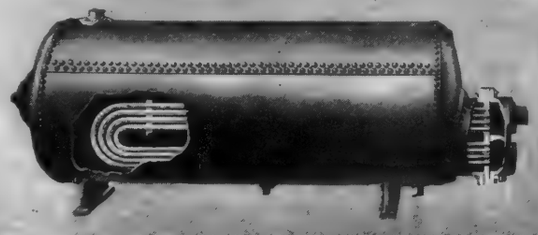
Men who are engineers, technical experts—men who build boilers themselves—buy on the strength of their own sufficient knowledge. You could not mislead them, if you wanted to.

When you specify "Patterson" Hot Water Heaters, your judgment is backed by thousands of men who know that Patterson Heaters are efficient and durable because of their mechanical training, as well as men who know from the service these heaters have given over a period of 45 years.

Write for copy of our catalog.

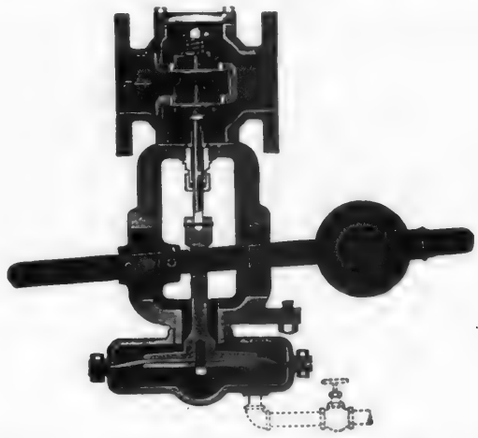
The Patterson-Kelley Co.

107 East 40th St. New York City



Quality KIELEY Simplicity

REGISTERED TRADE MARK



Engineers have specified Kieley Specialties for the Largest Buildings and Power Plants in the United States. Manufacturing Specialties for 47 years warrants that confidence.

KIELEY & MUELLER, Inc.

34 West 13th St., New York City

HARTMANN
RADIATOR BRACKETS

The radiator hangers used in the construction of a building furnish a good guide in determining the quality of the job. Hartmann Brackets are always to be found in a high-class installation because Architects, Engineers and Contractors have experienced that Hartmann Radiator Brackets are accurately and strongly made, are economical and always dependable.

THREE STYLES

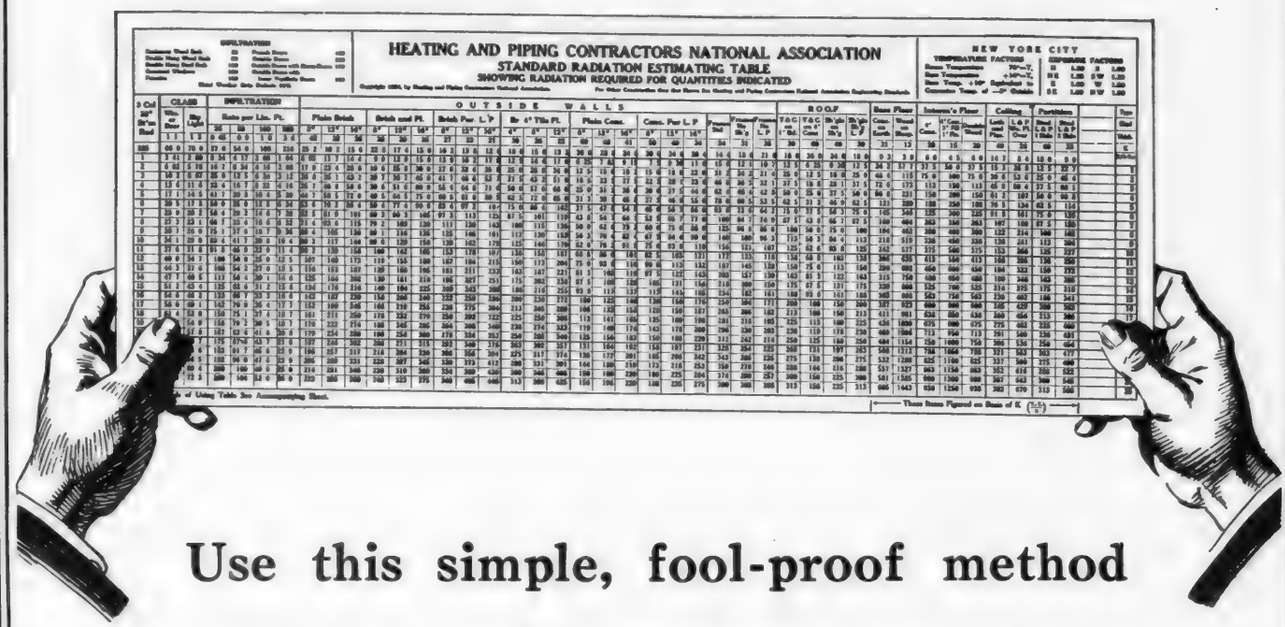
AR NR NV

Write for descriptive circular and price list

Charles Hartmann Co.

975-993 Dean Street - Brooklyn, N. Y.

The successful heating contractor knows most about RADIATION



Use this simple, fool-proof method

Radiation tables for the following cities have been prepared by the Heating and Piping Contractors National Association:

Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.
Denver, Colo.
Eastport, Me.
Kansas City, Mo.
Los Angeles, Cal.
Madison, Wis.
Memphis, Tenn.
Milwaukee, Wis.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
San Francisco, Cal
Salt Lake City, Utah,
San Antonio, Texas
St. Louis, Mo.
St. Paul, Minn.
Washington, D. C.

Note: If your city is not listed, request chart for city nearest to your locality.

THE successful heating contractor is the one who knows most about Radiation. His installations deliver **enough heat,** at the smallest fuel cost.

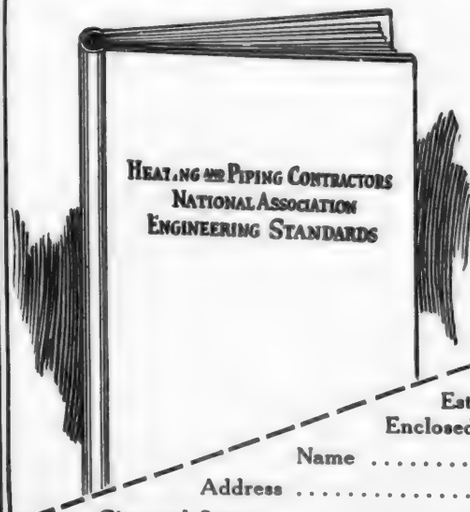
To determine the proper radiation in advance is no longer a problem, no longer guess work. The Heating and Piping Contractors National Association has reduced radiation estimating to a science—guess work and rule of thumb methods can be eliminated. The contractor need take no chances.

The Committee on Standardization of this nation-wide 37 year old organization of heating and piping contractors has expended over $100,000 in time and effort in an exhaustive study of radiation.

Complete radiation information is contained in a loose-leaf book entitled "Engineering Standards" and now made available to every heating contractor at a nominal cost of $5.00—a sum infinitesimal in comparison with its big value to the contractor.

All data to **figure radiation accurately** included: 151 constants for various types of construction and thickness of wall; infiltration factors and exposure factors are given.

Standard Radiation Estimating Tables for the twenty-four cities listed at the left are available in addition to this comprehensive book.



Limited Edition
Order Today

HEATING AND VENTILATING MAGAZINE,
1123 Broadway, New York, N. Y.

Date.....

Send me copy of "Engineering Standards" complete with all data necessary to correctly estimate radiation in any type of building. Also include Radiation Estimating Table for City of.....

Enclosed find check for $5.00 to cover cost and postage.

Name .....

Address .....

City and State.....

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

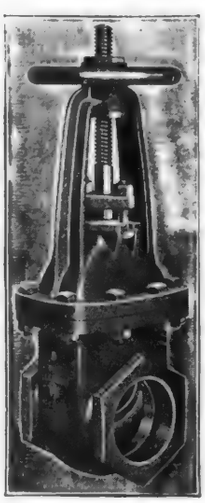
Erie, Pa.

A good place to live, to work and to play.

IRON BODY GATE VALVES

SCREWED, FLANGED
AND
HUB END STYLES

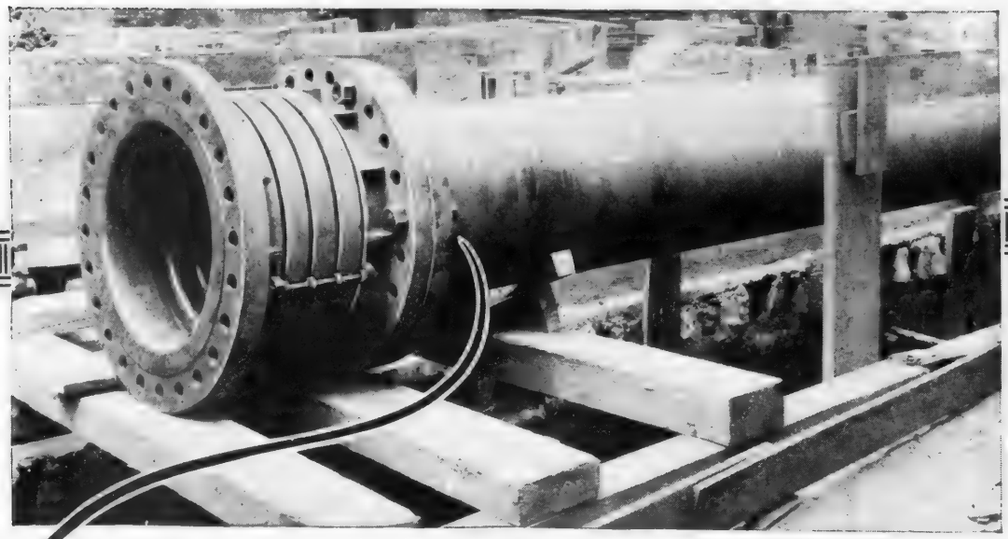
NON-RISING STEM
AND
O. S. and Y. PATTERNS

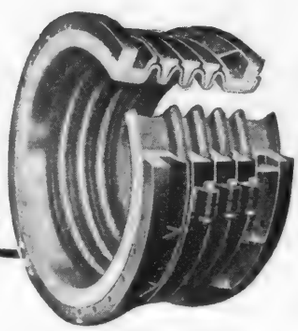


ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway **Chicago, Ill.**





Badger Expansion Joints

Study their construction and see for yourself why—

Your steam lines are afforded maximum protection in expansion and contraction. See how the equalizing rings distribute the variations in length uniformly over each deep corrugation in Badger construction.

Then note how easily Badger Expansion Joints are installed—just as simply as any flanged fitting and requiring no more space.

And note their one-piece construction of uniform strength, which entirely eliminates packing. "Install them and forget them" is an exclusive Badger slogan, for Badger Expansion Joints can be neglected with entire safety.

Their simplicity will impress you; their factor of safety will insure you against shut downs; their freedom from maintenance is your assurance that you pay just once for a Badger—when you install it.

Let Badger engineers—whose accumulated experience since 1841 designed these joints—help you in your piping problems. There's no obligation.

Badger Engineering Service

Badger engineers are designers, manufacturers and installation experts for the following and kindred power plant products:

Spray Cooling Ponds
Cooling Towers
Pipe Bends
Air Washers
Dust Washers
Special apparatus for Cleaning Flue Gases
Chemical Apparatus
Copper and Sheet Metal Work

TRADE MARK

E. B. BADGER & SONS CO.

75 Pitts St., Boston, Mass.

New York: 101 Park Ave. Toledo: Ohio Bldg.

Tulsa, Okla.: Mid-Continent Bldg.

Representatives in all principal cities.

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS.
Air Conditioning & Engineering Co., St. Louis, Mo.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Drying Systems, Inc., Chicago, Ill.
Fleisher Co., Inc., W. L. New York.
Games Slayter, Lafayette, Ind.
Grinnell Company, Providence, R. I.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

AIR COOLING AND DRYING SYSTEMS.
Aerofin Corp., Newark, N. J.
Autovent Fan & Blower Co., Chicago, Ill.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N.J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., New York.
Drying Systems, Inc., Chicago, Ill.
Fleisher Co., Inc., W. L., New York
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Midwest Air Filters, Inc., New York.
New York Blower Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spray Engineering Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

AIR ELIMINATORS.
Jas. P. Marsh & Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Midwest Air Filters, Inc., New York.

AIR FILTERS.
Badger & Sons Co., E. B., Boston, Mass.
Cooling Tower Co., New York.
Drying Systems, Inc., Chicago, Ill.
Duro Air Filter Co., Chicago, Ill.
General Air Filters Corp., New York.
Midwest Air Filters, Inc., New York.
National Air Filter Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.

AIR SEPARATORS.
Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., Inc., New York.
Fleisher Co., Inc., W. L. New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

BLOWERS
Fan.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

Pressure.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

BLOW OFF BASINS.
Cast Iron.
Inland Iron Works, Joliet, Ill.

BOILER CEMENT.
Johns-Manville, Inc., New York.

BOILER COMPOUNDS
Vinco Company, Inc., New York.

BOILERS.
Down-Draft.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
General Boilers Co., Waukegan, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Molby Boiler Co., New York.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works, Titusville, Pa.
Universal Smokeless Boiler Co., Ravenna, Ohio.

Gas Fired
American Gas Products Corp., New York.
Evenheat Mfg. Co., Chicago, Ill.
Ofeldt Gas Boiler Sales Corp, Chicago, Ill.

Heating.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Burnham Boiler Corp., Irvington, N. Y.
Continental Heater Corp., Dunkirk, N. Y.
Evenheat Mfg. Co., Chicago, Ill.
Fitzgibbons Boiler Co., New York.
Frost Mfg. Co., Chicago, Ill.
General Boilers Co., Waukegan, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Gurney Heater Mfg. Co., Boston, Mass.
Heggie Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Lebanon Boiler Works, Lebanon, Pa.
Molby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Radiator Co., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Niagara Radiator & Boiler Co., North Tonawanda, N. Y.
Page Boiler Co., Wm. H., New York
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Standard Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., Newark, N. J.
Titusville Iron Works, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Universal Smokeless Boiler Co., Ravenna, Ohio.
Utica Heater Co., Utica, N. Y.
Weil-McLain Co., Chicago, Ill.

Power.
Fitzgibbons Boiler Co., New York.
Frost Mfg. Co., Chicago, Ill.
Heggie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York

COILS, PIPE.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Pecco, Inc., St. Louis, Mo.
Whitlock Coil Pipe Co., Hartford, Conn.

Air.
New York Blower Co., Chicago, Ill.

CONCRETE INSERTS
Frank Radiator Bracket Co., Chicago, Ill.
Little Giant Mfg. Co., Minneapolis, Minn.

CONDENSERS.
Alberger Heater Co., Buffalo, N. Y.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER.
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Frank Heating & Engineering Co., O. E., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Wyckoff & Son Co., A., Elmira, N. Y.

COOLERS.
Oil.
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING PLANTS & PONDS
Spray Engineering Co., Boston, Mass.

COOLING TOWERS.
Badger & Sons Co., E. B., Boston, Mass.
Cooling Tower Co., New York.

COPPER BOILERS.
Badger & Sons Co., E. B., Boston, Mass.
Dahlquist Mfg. Co., Boston, Mass.

COPPER KETTLES.
Badger & Sons Co., E. B., Boston, Mass.
Dahlquist Mfg. Co., Boston, Mass.

COVERING PIPE.
American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville Inc., New York.
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A, Elmira, N. Y.

DAMPERS, DUCT.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
York Heating & Ventilating Co., Philadelphia, Pa

DEHUMIDIFYING APPARATUS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Cooling Tower Co., New York.
Fleisher Co., Inc., W. L., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y

DRAFT APPLIANCES.
Wolff Coal Saver Co., Chicago, Ill.

DRYING SYSTEMS.
(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa

DUST COLLECTORS.
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F. Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa

ENGINES.
Steam, Automatic.
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.
Hoffman Specialty Co., New York.

EVAPORATORS.
Boiler Feed Make-Up.
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y
Whitlock Coil Pipe Co., Hartford, Conn.

YOUNG

CENTRIFUGAL VACUUM AND BOILER FEED

Supplied in Standard Units of Seven Capacities

PUMPS

Low Power Consumption Distinguishes All Young Pump Operation

ONE of the requirements of a successful Centrifugal Vacuum and Boiler Feed Pump is that its power consumption for producing the vacuum be kept as low as possible.

In Young Pumps a highly efficient inclosed bronze impeller of the one piece type produces a positive pressure at a minimum consumption of current. The design of the Young Exhauster has also been worked out to secure an entirely adequate control of the steam, plus high air capacity, with the same small power outlay in the motor.

To accomplish these ends in a pump under varying load is no small task, yet Young has accomplished it. More than this, *the Young Pump unloads the motor as the amount of condensation being handled diminishes.* This also effects a marked economy in the operation of the pump. Yet with the by-pass fully opened the reserve power of the Young Pumps to discharge water is four times greater than the normal condensation rate of the system, revealing how easily the unit can take care of any peak load which it may be called upon to handle.

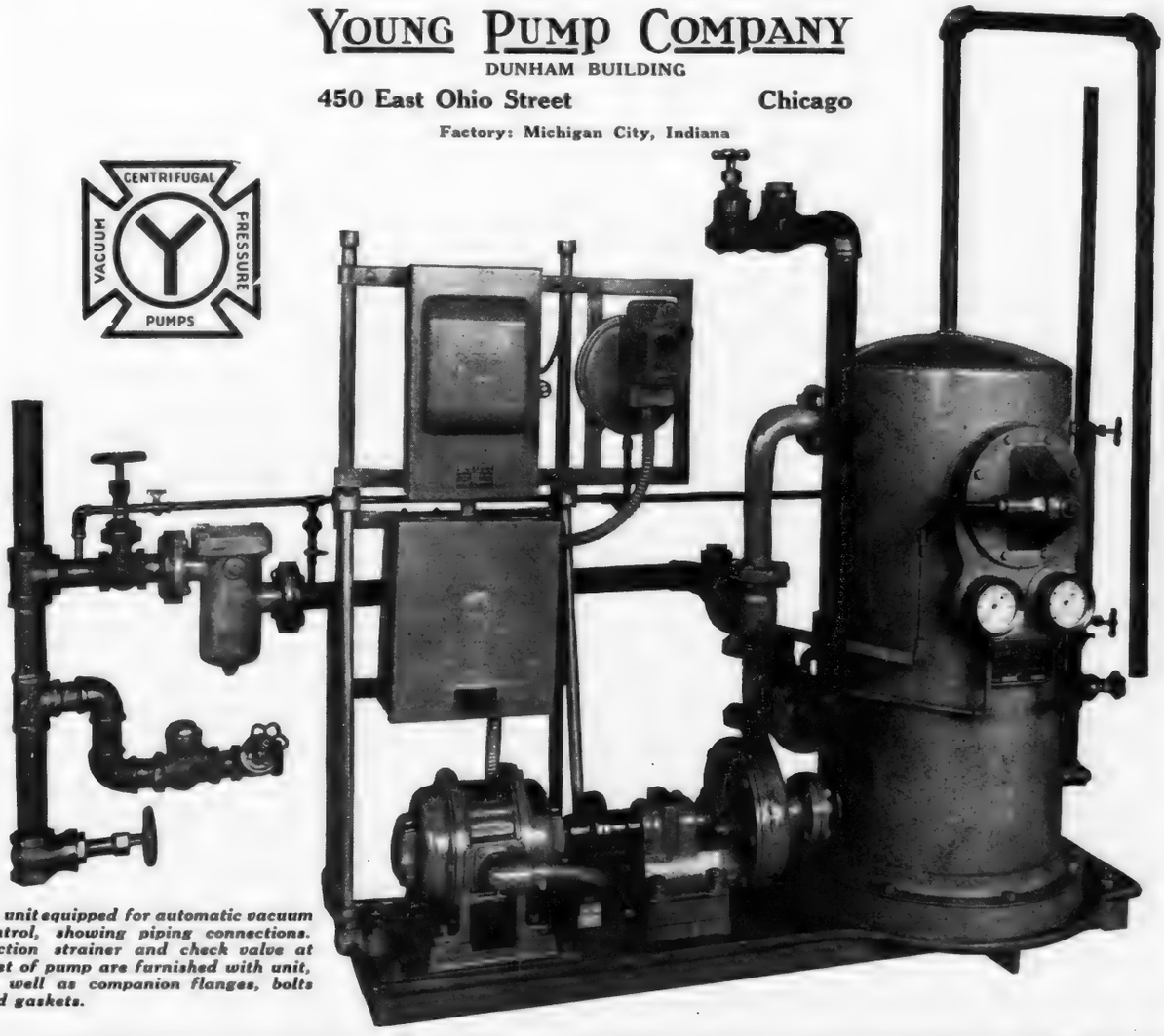
YOUNG PUMP COMPANY

DUNHAM BUILDING

450 East Ohio Street **Chicago**

Factory: Michigan City, Indiana

CENTRIFUGAL VACUUM PRESSURE PUMPS



V1 unit equipped for automatic vacuum control, showing piping connections. Suction strainer and check valve at inlet of pump are furnished with unit, as well as companion flanges, bolts and gaskets.

ENGINEERS' SPECIFICATION INDEX (Continued)

EXHAUST HEADS.
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo
Sturtevant Co., B. F., Hyde Park, Mass
Wright-Austin Co., Detroit, Mich

EXHAUST SYSTEMS.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Co., Philadelphia, Pa

EXPANSION JOINTS.
American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Seymour, James M., Newark, N. J
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa

FEEDERS
Boiler
Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.

FILTERS, (Aerating).
Davis Engineering Corp., New York.
Griscom-Russell Co., New York.

Feed-Water.
Davis Engineering Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GAUGES.
Altitude
Pierce, Butler & Pierce Mfg. Co., New York.

Draft.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.
Marsh & Co., Jas. P., Chicago, Ill
O-E Specialty Co., Milwaukee, Wis.

Pressure.
American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Co., New York.
Webster & Co., Warren, Camden, N. J.

Vacuum.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).
Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Mfg. Co., New York.

Water.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Cooling Tower Co., New York.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES
Dumping
Pyramid Iron Products Co., New York.

Rocking
Pyramid Iron Products Co., New York.

Shaking
Pyramid Iron Products Co., New York.

Shaking and Dumping
Pyramid Iron Products Co., New York.

Shaking, Circular
Pyramid Iron Products Co., New York.

Stationary
Pyramid Iron Products Co., New York.

HEAT CABINETS
Trane Co., LaCross, Wis.

HEATERS.
Domestic Water.
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Badger & Sons Co., E. B., Boston, Mass.
Burnham Boiler Corp., Irvington, N. Y.
Dahlquist Mfg. Co., Boston, Mass.
Davis Engineering Co., New York.
Excelso Specialty Works, Buffalo, N. Y.
Frank Heating & Engineering Co., O. E., Buffalo, N. Y.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Standard Heater Co., Williamsport, Pa.
Thermal Appliance Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

Electrical Unit
Ilg Electric Ventilating Co., Chicago, Ill.

Feed Water, (Closed).
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Frank Heating & Engineering Co., O. E., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).
Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.
Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich
Davis Engineering Corp., New York.
Drying Systems, Inc., Chicago, Ill.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air Fan System.
Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Drying Systems, Inc., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Long Island City, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.

Magazine Feed
Standard Heater Co., Williamsport, Pa.

Portable Unit Air.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill
Mueller Furnace Co., L. J., Milwaukee, Wis.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.
"Gasteam".
James B. Clow & Sons, Chicago, Ill.

Vacuum.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Standard Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind
Webster & Co., Warren, Camden, N. J.

Vapor.
American District Steam Co., No. Tonawanda N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mount Vapor Heating Co., Cleveland, O
Nelson Corporation, Herman, Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Standard Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis
Trane & Co., La Crosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

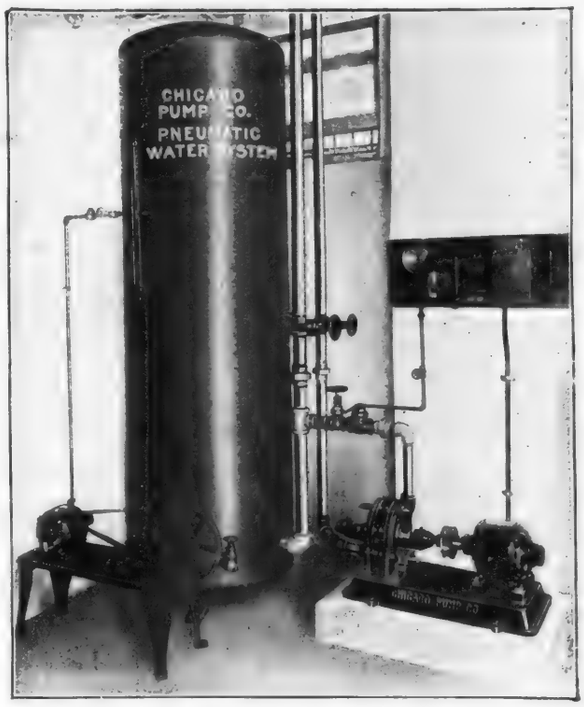
Water.
Grinnell Company, Providence, R. I.
Patterson-Kelley Co., New York.
Standard Heater Co., Williamsport, Pa.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J
Drying Systems, Inc., Chicago, Ill.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.
American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Drying Systems, Inc., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INSTRUMENTS
Electric Measuring.
Bristol Co., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass



HOT WEATHER—

is now here, and soon you will be getting those every year complaints to keep the top floor tenants supplied with plenty of water.

Water which flows freely from the second and third floor faucets during the winter months fails to appear on the hot summer days—when it is most needed.

WHAT TO DO?

Merely install a Chicago Pump Company's Pneumatic Water System as illustrated at the left. This unit is designed to automatically supply any size or style of building with water without the use of a roof or attic tank. It is installed in the basement between the city main and building riser. Plenty of water is kept in the storage tank at all times *automatically* to meet the peak periods.

The "Chicago" Pneumatic units are manufactured on a quantity production basis, making the price unusually low for this splendid outfit. This also insures a *24 Hour Delivery* as all sizes are always kept in stock.

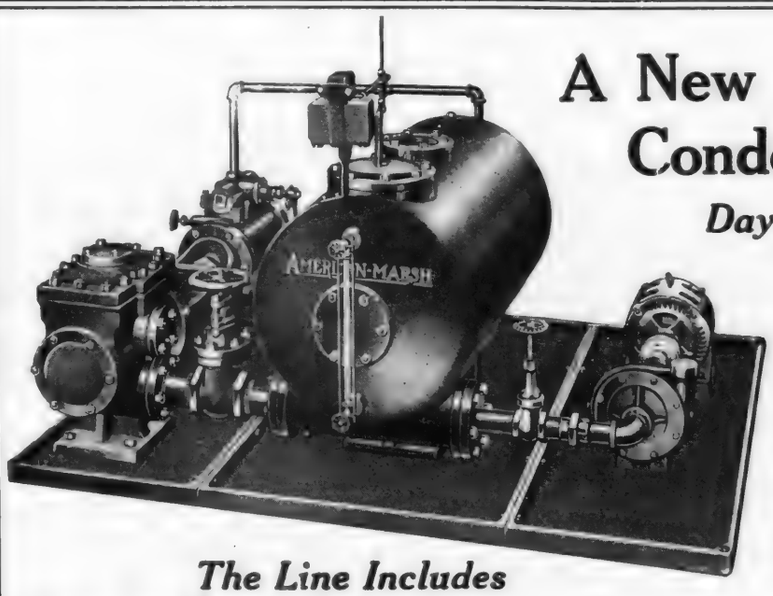
Let us send you Bulletin 111 which fully describes this pneumatic water system and tells you how to figure the proper size unit for any building.

Quality Centrifugal Pumps for Every Service

Circulating *Sewage* *Condensation*
Bilge *Fire* *House* *Vacuum*

Chicago Pump Company

2325 Wolfram Street **Chicago, Illinois**



A New American Marsh Condensation Pump

Day and Night Service

This new Condensation Pump is designed for use where there is a wide variation in steam pressure. When the steam pump stops operating because of lack of steam pressure a motor driven centrifugal pump, which is controlled automatically, keeps the return lines free from condensation. This is important, for it keeps the return lines clear and continues to operate until enough steam is generated to operate the steam pump. It is really a day and night pump. Practical, efficient and economical.

Write for Bulletin No. 58

The Line Includes

Boiler Feed Pumps—Vacuum Pumps.
Hot Water Circulating Pumps.
Sump or Bilge Pumps.
Condensation Pumps, steam and motor driven, vertical and horizontal.
Automatic Boiler Feed Pumps and Receivers.

AMERICAN STEAM PUMP COMPANY

BATTLE CREEK, MICHIGAN

CHICAGO OFFICE: 926 Monadnock Block **NEW YORK OFFICE: 17 Battery Place**

ENGINEERS' SPECIFICATION INDEX (Continued)

Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Universal Gypsum Co., Chicago, Ill.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.
Pearce & Co., W. H., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Flow

American District Steam Co., North Tonawanda, N. Y.
Spray Engineering Co., Boston, Mass.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Century Electric Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

NOZZLES, SPRAY

American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Manufacturing Co., Milwaukee, Wis.
Carrier Air Conditioning Co. of America, Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., New York
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

OIL BURNERS

American Nokol Co., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Automatic Home Heating Co., Pueblo, Colo.
Caloroil Burner Corp., New York
Chalmers Oil Burner Co., Minneapolis, Minn.
Combustion Fuel Oil Burner Co., Milwaukee, Wis.
Crosley Radio Corp., Cincinnati, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electrol Incorporated, St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
Marr Oil Heat Machine Cor., Minneapolis, Minn.
May Oil Burner Corp., Baltimore, Md.
Nu-Way Corporation, Rock Island, Ill.
Petroleum Heat and Power Co., New York.
Rayfield Mfg. Co., Chicago, Ill.
Wilde Co., W. B., Peoria, Ill.
Winslow Boiler & Engineering Co., Chicago, Ill.

OIL BURNER ACCESSORIES

Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Monroe Machine Tool Co., Chicago, Ill.
Webster Electric Co., Racine, Wis.

OZONE APPARATUS.

Air Conditioning & Engineering Co., St. Louis, Mo.
United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Steel.

National Tube Co., Pittsburgh, Pa.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Du Moin Pump Sales Co., Des Moines, Iowa.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR HANGERS.

Frank Radiator Bracket Co., Chicago, Ill.
Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Company, St. Paul, Minn.
Little Giant Mfg. Co., Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
National Radiator Co., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York
Standard Heater Co., Williamsport, Pa.
United States Radiator Corp., Detroit, Mich.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Kieley & Mueller, Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Honeywell Heating Specialties Co., Wabash, Indiana.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill
Nelson Corporation, Herman, Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Honeywell Heating Specialties Co., Wabash, Indiana.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn.
Honeywell Heating Specialties Co., Wabash, Indiana.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
White Mfg. Co., St. Paul, Minn.

SEPARATORS.

Oil.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Stickle Steam Specialties Co., Indianapolis, Ind
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich

SOUND PROOFING MATERIALS

Cork Foundation Co., New York.

SPRAY COOLING SYSTEMS.

Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Cooling Tower Co., New York.
Massachusetts Blower Co., Watertown, Mass
Seymour, James M., Newark, N. J.

SPRAY NOZZLES

(See Nozzles, Spray)

STOKERS

CombustiKator Co., Chicago, Ill.
Domestic Stoker Co., New York.

STRAINERS.

Oil.

Griscom-Russell Co., New York.
Kieley & Mueller, Inc., New York.
Monroe Machine Tool Co., Chicago, Ill.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y

Steam.

American Dist. Steam Co., No. Tonawanda N Y.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis.
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda. N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N Y
Sarco Co., New York.
Spray Engineering Co., Boston, Mass.

THERMOMETERS.

(Recording and Indicating).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

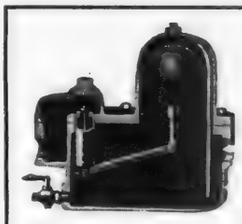
THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn.

"Buffalo" pumps for heating systems—

If you want to be able to install pumps with a heating system—and then forget about them—use Buffalo Class "S" or "SL". The largest companies find that the features of "Buffalo" construction save money for them. Why not get full information, Now?

BUFFALO STEAM PUMP COMPANY
480 BROADWAY, BUFFALO, NEW YORK.
In Canada: Canadian Blower & Forge Company, Ltd., Kitchener, Ont.



WRIGHT-AUSTIN
"VICTOR"
STEAM TRAPS
Low Pressure

Have very large capacity on low pressures or no pressure at all. Operate on the overflow principle. Very simple and sturdy in construction. Will not get out of order.

Ask for Bulletin No. 201
WRIGHT-AUSTIN CO.
DETROIT, MICH.

YEOMANS
YEOMANS PUMPS GIVE YEOMAN SERVICE
The mark of Dependability

CONDENSATION PUMPS
AUTOMATIC ELECTRIC NOISELESS RUGGED
Built for all pressure and capacity requirements

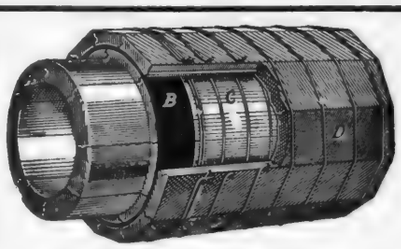
Special bulletin giving sizes, dimensions and capacities with details sent on request.

Special Type H High Pressure Unit.

Also manufacturers of Bilge Pumps, Centrifugal Pumps, Sewage Ejectors, Sewage Pumps, etc.

YEOMANS BROTHERS CO.
1421 Dayton St. Representatives in all principal cities. Chicago, Ill.
DEPENDABILITY

Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

ENGINEERS' SPECIFICATION INDEX (Continued)

Honeywell Heating Specialties Co., Wabash, Indiana.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS.

Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mouat Vapor Heating Co., Cleveland, O
Nelson Corporation, Herman, Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Engineering Co., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Pearce & Co., W. H., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.

American Blower Co., Detroit, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pearce & Co., W. H., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O
Wyckoff & Son, A., Elmira, N. Y

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill
Spencer Turbine Co., Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Mass.

VALVES.

Air (Automatic).

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

Air Relief.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.

Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

Check.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Float.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.

American District Steam Co., No. Tonawanda, N. Y.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Globe, Angle and Cross.

Commonwealth Brass Corp., Detroit, Mich.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.

Hydraulic-Operating.

Atlas Valve Co., Newark, N. J
Kieley & Mueller, Inc., New York.

Non-Return.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Radiator.

American Radiator Co., Chicago, Ill
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Honeywell Heating Specialties Co., Wabash, Indiana.
Ideal Heating Equip. Co., Cleveland, Ohio
Illinois Engineering Co., Chicago, Ill
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Regulating.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Relief (Water).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.

(See Valves, Non Return).

VENTILATING HEATERS

Portable Unit.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
Mueller Furnace Co., L. J., Milwaukee, Wis.
Nelson Corporation, Herman, Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., Long Island City, N. Y.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa

(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS

Air Conditioning & Engineering Co., St. Louis, Mo.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass
Nelson Corporation, Herman, Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., Long Island City, N. Y.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa

VENTILATORS.

Aeolus Dickinson Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., Long Island City, N. Y.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa

Mushroom.

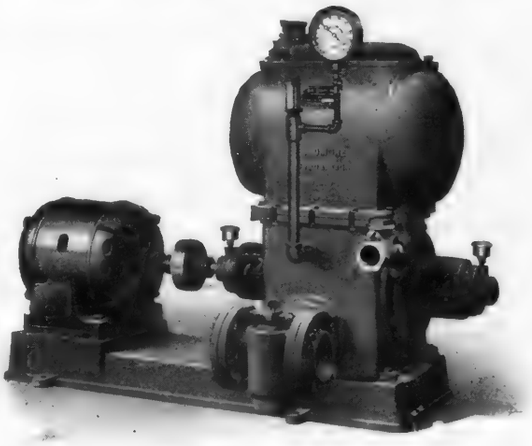
Aeolus Dickinson Co., Chicago, Ill.
Knowles Mushroom Ventilator Co., New York
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
Ventilating Products Co., Chicago, Ill.

WEATHER STRIPS.

Metal.

Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.

SKIDMORE



The New Type "B"

THE Skidmore Hydro Turbine Vacuum and Boiler Feed Pump is now entering its fifth year.

Units that have been in service four heating seasons show the same efficiency that was shown when installed.

The new type offered retains all the advantages of those now in service, the change in design being in the casing to secure a more compact and sturdy unit.

All parts are of high grade cast iron or bronze, accurately machined.

There are no close clearances on moving parts and no piping is required to set the unit.

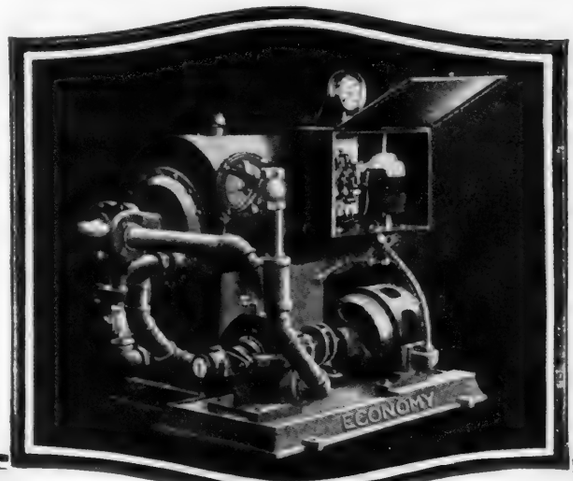
A self-contained unit all on one base.

Built in seven sizes for 10 to 60 lbs. pressure to handle 5,000, 8,000, 16,000, 26,000, 40,000, 65,000 and 100,000 sq. ft. of radiation for continuous service or with automatic control

SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.



Type C. V. Fig. 2234—Single Model Vacuum Pumps

DEPENDABILITY

This is an essential requirement of all apparatus entering into the equipment of every worth while project.

Economy Centrifugal Vacuum Pumps

embody every requisite of high class equipment. They are well motored with ample reserve power. They never burn out, consequently shut downs are avoided.

They have ample air, water and pressure capacity.

They have longer life than other types.

They maintain their efficiencies.

They are scientifically designed.

They have the best thought of competent hydraulic and heating engineers built into them.

They require less attention and upkeep than other types.

They reduce noise in radiators and piping.

They operate quietly.

They use no more power than other pumps that do the same work.

They are guaranteed for performance and quality.

Representatives in Every Large City

Economy Pumping Machinery Co.

71-122 North Curtis St. CHICAGO

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Beautiful Buildings — Spencer Cleaned

MASONIC TEMPLE
Detroit, Mich.

Geo. D. Mason & Company
Architects

The Masonic Temple of Detroit is an edifice of which the community is justly proud. It is of outstanding beauty.

Beauty demands cleanliness to preserve it. For this reason, the architect had the SPENCER CENTRAL CLEANING SYSTEM installed. Realization of the completeness of the system prompted this.

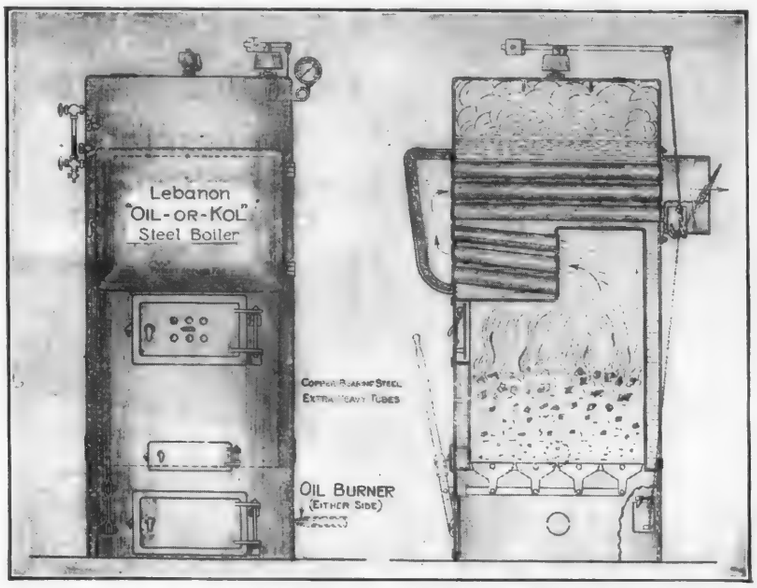
The Spencer Turbine Company keeps pace with large and small constructions all over the country. Leading Engineers include the Spencer System in their specifications.

The Spencer Turbine Company
Hartford, Conn.

For Homes and Small Buildings

Lebanon "Oil-or-Kol" Steel Boilers

Steam, Water or Vapor Heating—Domestic Hot-Water Supply



A Compliment

The U. S. Treasury Department recently purchased thirty-three O. K. Boilers on one order.

PLEASE ASK FOR BULLETIN 26-B

LEBANON BOILER WORKS

PHILADELPHIA OFFICE
507 Harrison Bldg.
(15th & Market Sts.)

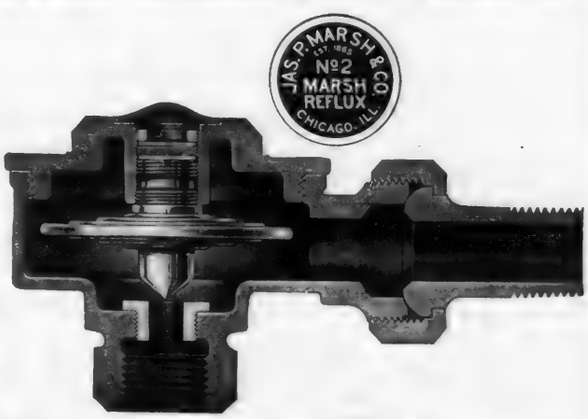
J. K. PETTY & CO., Inc., Proprietors
Main Office and Works, 1244 Buttonwood Street
LEBANON, PA.

Koithan & Pryor, Representatives
39 Cortlandt St., NEW YORK CITY
Representatives in Principal Cities

MARSH REFLUX THERMOSTATIC RADIATOR TRAPS

GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



The Most Economical, Practical and Efficient Trap for the Average Sized Unit

Marsh Reflux Traps assure full efficiency of Radiator Coil and System.

Automatically discharge air and the water of condensation as fast as it is formed.

The Trap closes the instant steam or vapor strikes the thermostatic diaphragm. Vapor or steam cannot pass through the Trap; therefore every atom of heat is given off in the radiator or coil.

Just one movable part—nothing loose to rattle, chatter or make a noise.

Neat in appearance, handsomely finished and heavily nickel-plated.

The Economical, Practical and Efficient Trap for Both Small and Large Units

Marsh Reflux Traps are all-metal construction including heavy cast brass body, handsomely nickel-plated and with extra heavy special tail piece.

The one movable part—a genuine phosphor bronze non-collapsible Thermostatic Diaphragm—contains the combination of volatile fluids so balanced as to, at all times, distinguish between air and water of condensation and vapor or steam. So corrugated and constructed to eliminate the slightest possibility of rupture from alternate expansion and contraction.

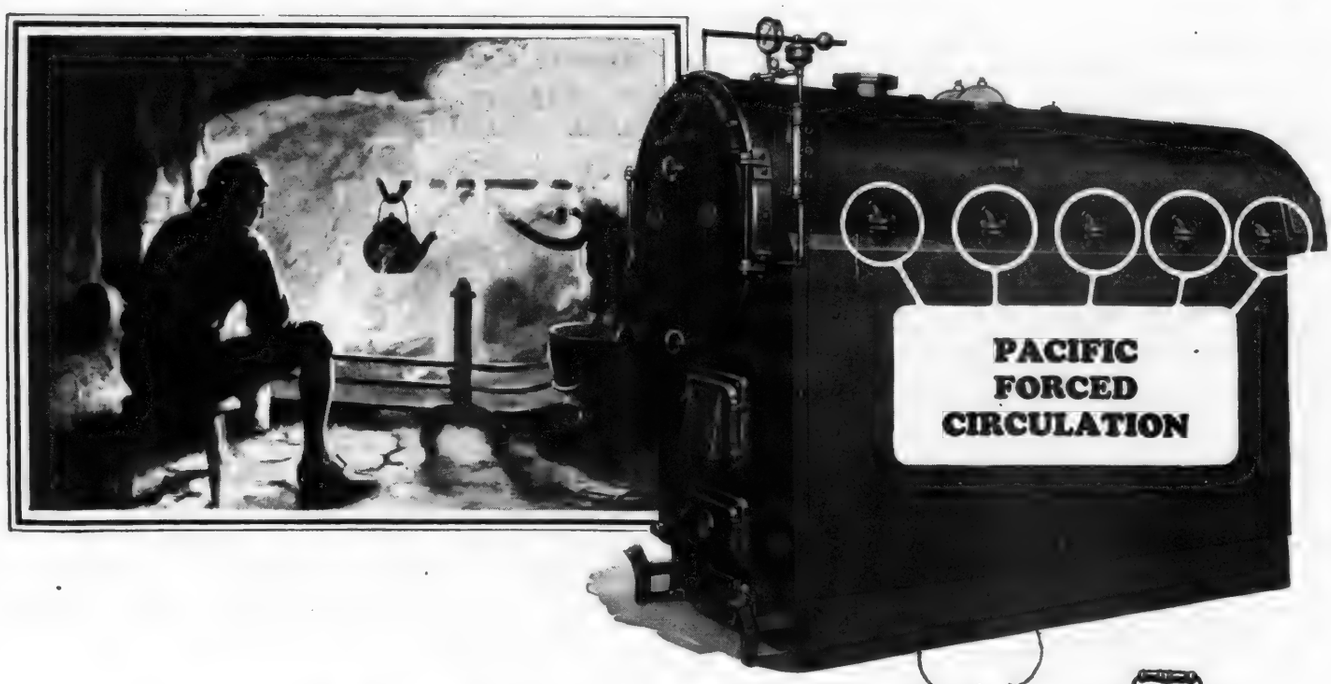
JAS P. MARSH & CO.

114-124 So. Clinton St.
ESTABLISHED 1865
Chicago

61 YEARS CONTINUOUS EXPERIENCE IN MANUFACTURE OF STEAM SPECIALTIES

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents—Indicating and Recording Gauges

Agents for Great Britain and Ireland: Ohatterton & Co., 30 Fetter Lane, E. C. 4, London.
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario.



Watt's Teakettle and Forced Circulation

Tradition says that the teakettle was Watt's inspiration for the remarkable inventions which led to present-day steam engineering.

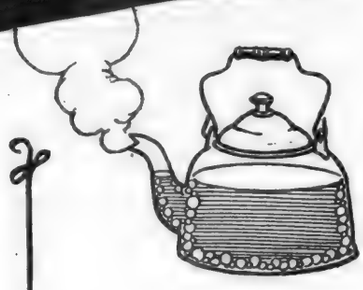
But since the days of Watt there has been more than a century of progress. The principle of the teakettle—unrestricted circulation—has been discarded by up-to-date boiler engineers of today. For in Watt's teakettle they found a heat insulating effect due to the presence of steam bubbles.

The modern idea in boilers is *forced circulation*, to break up these steam bubbles and speed up heat transfer. It's a fundamental principle in large power boilers noted for high efficiency — and Pacific engineers have applied it to Pacific Steel Heating Boilers. Between the firebox and shell are connections through which water and steam are forced, causing a scrubbing action on the heating surfaces which removes all steam bubbles and adds efficiency.

Forced circulation is but one of the reasons for the nation-wide leadership of Pacific Boilers in the heating field.

Write for catalogs and complete information.

GENERAL BOILERS COMPANY
WAUKEGAN, ILLINOIS
BRANCH OFFICES IN PRINCIPAL CITIES



How Unrestricted Circulation Retards Heating

When heat is applied to a solid body of water contained in a boiler, steam bubbles form and cling to the heating surfaces, unless there is some force to break them up.

These steam bubbles are perfect heat insulators. They block the passage of heat from the fire to the water within the boiler, slowing up heating and reducing boiler efficiency and capacity.

In Pacific Boilers the heating surfaces are continually swept clean of steam bubbles by the forced circulation created in the connections between the firebox and shell, an *exclusive* Pacific feature.

PACIFIC
STEEL HEATING BOILERS

KEWANEE

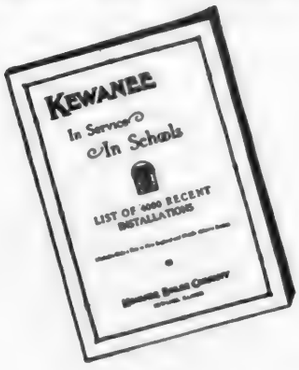
Heats

4000

Finer Recent Schools

with

Kewanee Steel-Riveted Boilers



This list is mighty convenient for reference in any part of the United States wherever buildings have to be heated

If you care for a copy of the data kindly write

KEWANEE BOILER COMPANY

KEWANEE ILLINOIS

ATLANTA	1522 Candler Building	DALLAS	1903-1904 Santa Fe Bldg.	LITTLE ROCK	313-315 E. Markham St.	PEORIA	103 Farmington Road
BOSTON	1140 Little Bldg., 90 Boylston St.	DENVER	1226-1228 California St.	LOS ANGELES	306 Crocker St.	PHILADELPHIA	806 Real Estate Trust Bldg.
CHARLOTTE	1016 Johnston Building	DES MOINES	707 Hubbell Building	MEMPHIS	1812 Exchange Building	PITTSBURGH	Empire Building
CHATTANOOGA	1104 James Building	DETROIT	2051 West La Fayette Blvd.	MILWAUKEE	440 Barclay St.	ST. LOUIS	4200 Forest Park Blvd.
CHICAGO	822 W. Washington Blvd.	EL PASO	1520 N. Campbell St.	MINNEAPOLIS	708 Builders Exchange Bldg.	SALT LAKE CITY	204 Dooly Bldg.
CINCINNATI	P. O. Box 75	GRAND RAPIDS	402½ Michigan Trust Building	NEW ORLEANS	1018 New Orleans Bank Building	SAN ANTONIO	502 Calcasieu Bldg.
CLEVELAND	Superior Ave., N. E., at 17th St.	INDIANAPOLIS	221 Indiana Terminal Warehouse	NEW YORK	570 Seventh Ave.	SAN FRANCISCO	635 Mission St.
		KANSAS CITY	2014 Wyandotte St.			SEATTLE	326 Columbia St.
						TOLEDO	415 13th St.

DOMINION KEWANEE BOILER COMPANY, LTD., 66 Richmond Street, East, Toronto 2, Ontario

Heating Boilers, Water Heaters, Radiators, Water Heating Garbage Burners, Tanks

"Beware of Imitations"

To Stimulate Imagination

It took some time to decide on allowing this picture of the hobo to get into print.

But perhaps it best typifies better than anything else the situation in thousands of homes today. Inadequate heating plants struggling against a hopeless task. Ridiculous situations. The story of the comforts and economies of Gurney Boilers will get business in the most unexpected places. In performance they make old style heating apparatus seem like imitations of the real thing.

Gurney Boilers

The Acme of Modern Heating Engineering

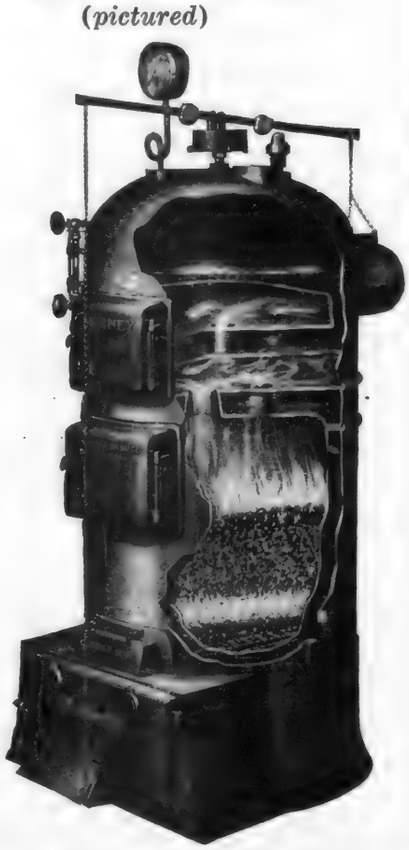
Simplicity is the keynote of anything modern.

You would want to sell a Gurney Boiler if only for the fact that it doesn't take a 'month of Sundays' to install. That isn't all, though. A Gurney Boiler cuts down furnace-tending time, it has a minimum of parts to get out of order, it occupies less cellar space, it delivers heat without forcing, it has generous fire box and ash pit . . . substantially, it gives the user more than he expects in about every instance.

Its genuine worth appeals to everybody. Much of the so-called sales resistance is overcome because of this.

Lenox cut-out view

(*pictured*)



GURNEY HEATER M'F'G COMPANY

GENERAL OFFICES, BOSTON, MASS.

93-97 OLIVER STREET, FORT HILL SQUARE

GURNEY HEATER CO., INC.
NEW YORK
MANLY ST. COR. ANABLE AVE
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GURNEY HEATER M'F'G CO.
RICHMOND, VA
418 EAST MAIN STREET

GURNEY HEATER CO., INC.
PHILADELPHIA
108 NORTH 17TH ST.

Here's a Money Maker for you

Well rated concerns, or financially responsible individuals—who can sell to architects, heating contractors and building owners—can make money with this heating specialty. There is nothing like it—so it can't conflict with any line you may now handle. On the contrary, it will "round out" your work, and give you something to sell which has *made good wherever used.*

Wolff Draft Conditioners

Ask any owner who has them installed in connection with his heating plant. **He will tell you they do everything we claim for them.**

In the City of Chicago alone more than 5,300 have been installed in the finest buildings. They are saving fuel—anywhere from 25 to 50 per cent—improving heating conditions, and making the heating plants easier to handle.

Agents are being selected in all cities not now covered. If yours is one of them there is a good opportunity for you, selling and installing them.

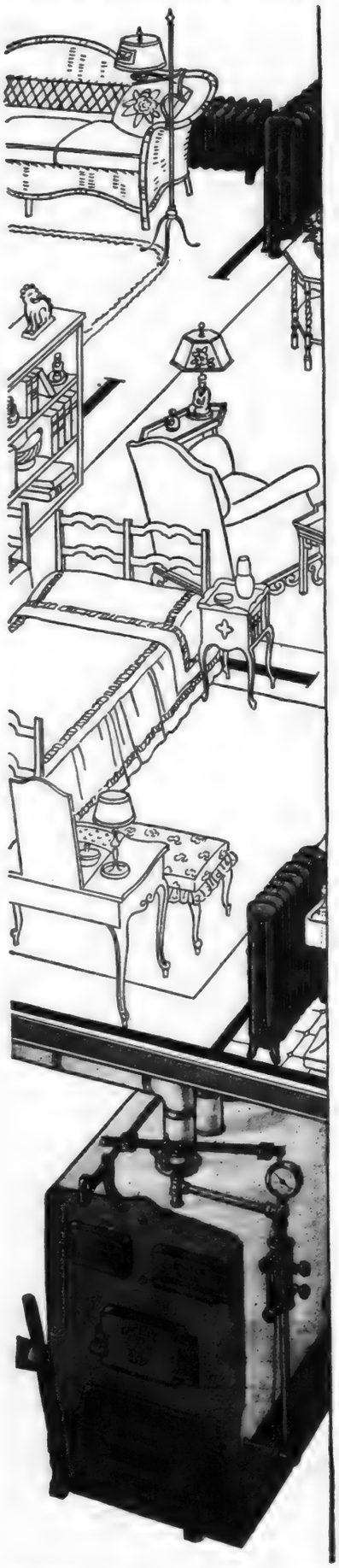
They won't "sell on sight"—nothing will. But if an architect or owner will listen to you it isn't hard to convince him with the proof we have to offer.

We can prove all this to you. May we?

Wolff Coal Saver Co.

1336 West Congress St. **Chicago**

DEPENDABLE HEAT ALL OVER THE HOUSE WITH ECONOMY



Capitol Guaranteed Heating is Nationally Advertised

Month after month, attractive color pages in the leading national magazines carry the story of Capitol Guaranteed Heating into every city and town in the land.

Besides its great help to you in choosing and installing the proper boiler, Capitol Guaranteed Heating is a powerful selling aid.

Daily more people know about it. Want it. And have more confidence in the contractor who sells it.

Use Capitol Guaranteed Heating to increase your business.

UNITED STATES RADIATOR CORPORATION

Detroit, Michigan

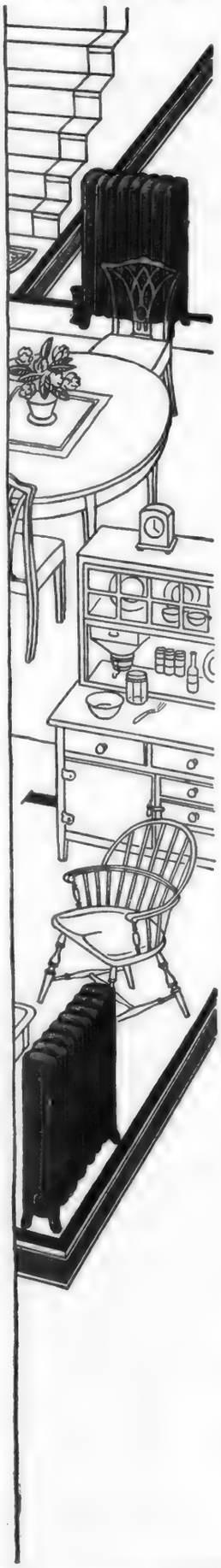
6 FACTORIES AND 28 ASSEMBLING PLANTS SERVE THE COUNTRY

For 36 years, builders of dependable heating equipment

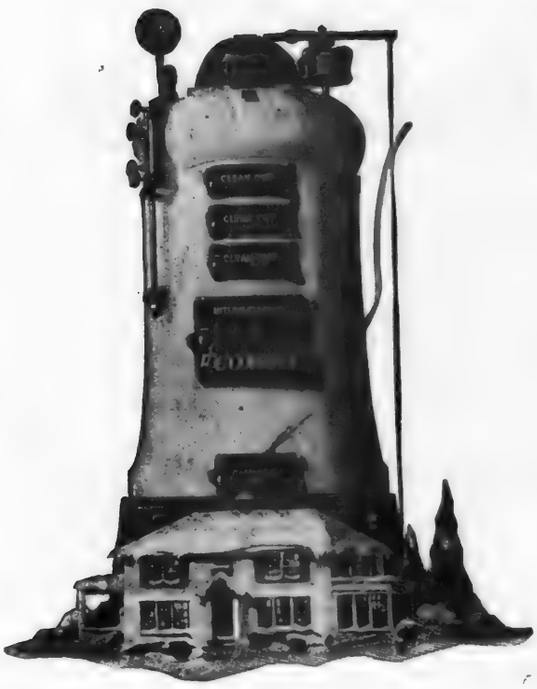
Capitol Boilers

and

UNITED STATES RADIATORS



SUPPLIED AND INSTALLED NATIONALLY BY ESTABLISHED HEATING CONTRACTORS



GUARANTEED RATINGS

for

ECONOMY BOILERS

Cut Out All Guesswork

RADIATION Loads, which have been fixed for all INTERNATIONAL Economy Boilers, make it easy to select the proper size for any heating job. Behind these guaranteed ratings stands a company whose eighty-five years of experience in manufacturing heating equipment has merited and held the confidence of the heating trade.

INTERNATIONAL Economy Round Boilers deliver heat at a minimum of expense and care—a saving proposition for your boiler customers.

Ample coal capacity means fuel economy because of slower, even burning. Adapted for any kind of fuel.

Proper combustion is insured by the shape of the firepot and the air control. The high heating absorption power of the INTERNATIONAL Economy turns every possible pound of fuel into heat.

Economy Boilers have been endorsed by leading engineers in the oil burner industry as being unusually efficient with oil burners because of their large combustion space and long flue travel.

Send for catalog 1746-H which describes square and round sectional boilers in detail.

SUPPORTING MEMBER

INTERNATIONAL HEATER COMPANY

UTICA, NEW YORK

NEW YORK CHICAGO CLEVELAND DETROIT PHILADELPHIA NASHUA, N. H.

Western Canadian Distributors: Heating Supplies, Ltd., 902 Home Street, Winnipeg, Manitoba

Titusville Boilers in these Modern Riverside Drive Apartments

In these ultra-modern apartments, where only the finest equipment was used—it was only natural that Tico Horizontal Tubular Boilers should be installed.

The apartments illustrated are located at 839 to 845 Riverside Drive, New York City, and were erected by Friedman and White Company,—the owners. The heating contract was directed by the Lee Heating Company.

THE TITUSVILLE IRON WORKS CO.

TITUSVILLE PENNA.

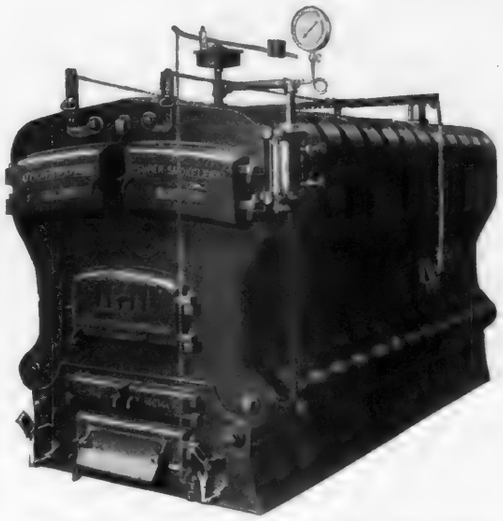
SALES OFFICES

New York, 152 West 42nd Street
Pittsburgh, Pa., Farmers Bank Bldg.
Buffalo, N. Y., Marine Trust Bldg.
Chicago, Ill., 1124 Harris Trust Bldg.
Detroit, Mich., No. 833 Washington Blvd. Bldg.
Washington, D. C., Woodward Building

ALDEN PARK MANOR, PHILADELPHIA, PA.

Kenneth M. Devos, *Architect* Packard & Westphal, *Heating Contractors*

Guarded Against Any Fuel Emergency!



Exterior View of Boiler Showing Air Inlet

Utica Imperial SUPER-SMOKELESS Boilers will utilize successfully any available fuel—soft coal, hard coal, coke or oil. They will burn soft coal without smoke and with the greatest efficiency, utilizing as valuable fuel the smoke and soot ordinarily wasted up the stack. All of the heat units in the fuel are utilized, the smoking stack is eliminated, and every ton of coal burned is made to give out a greatly increased amount of heat. Although widely imitated in partial detail, the SUPER-SMOKELESS remains the only boiler in which the Bunsen Burner principle is properly applied. No other boiler so completely and efficiently solves the smoke and fuel problems.

UTICA—IMPERIAL

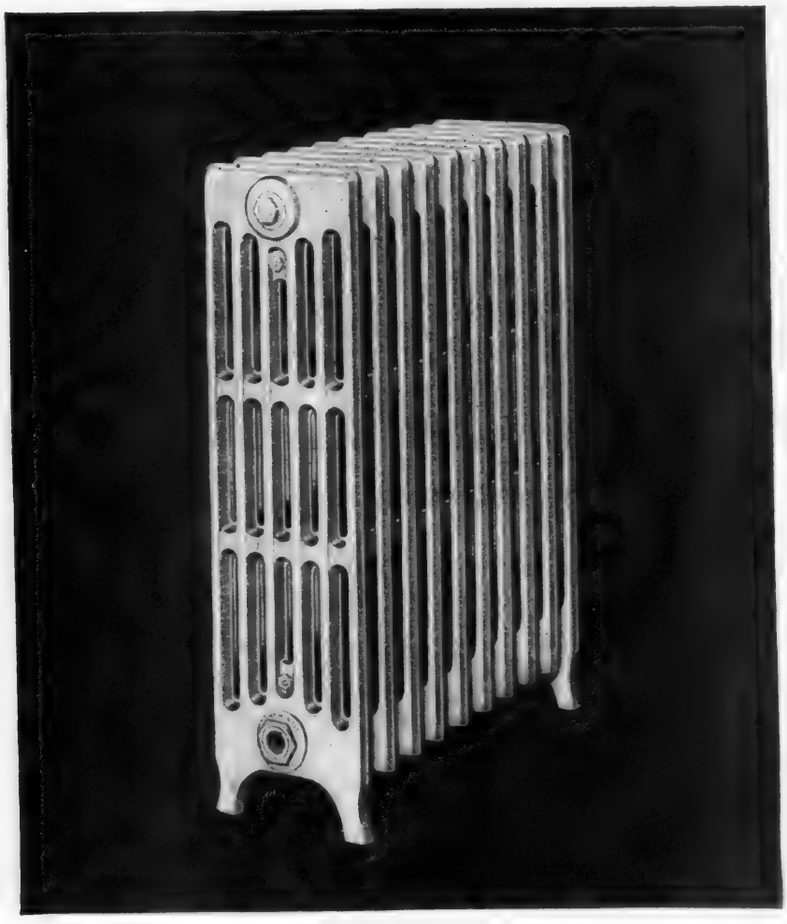
SUPER-SMOKELESS-BOILERS

Manufactured by the

UTICA HEATER COMPANY, UTICA, N. Y.

"Pioneers in Smokeless Combustion"

Sales Offices in the Principal Cities



Announcing
THE *new* CONTINENTAL CLASSIC RADIATOR

It's Ready! The radiator of radiators . . . New . . . Artistic . . . Beautiful . . . Classic in name . . . Classic in appearance . . . *and*—a Continental.

The open design of its columns provides unusually free air circulation in addition to good interior circulation. It has full rated radiation surface yet occupies less floor space than standard radiators. Beautifully smooth Continental castings provide a flawless surface for any finish.

The new Continental-Classic Radiators are ready for immediate delivery in the six column size and four standard heights.

CONTINENTAL CLASSIC RADIATOR

Continental Heater Corporation
Home Office and Factory
Dunkirk, N. Y. U.S.A.

CONTINENTAL CLASSIC RADIATOR

Boiler Lung Power

Lung capacity means as much to the boiler as it does to the athlete

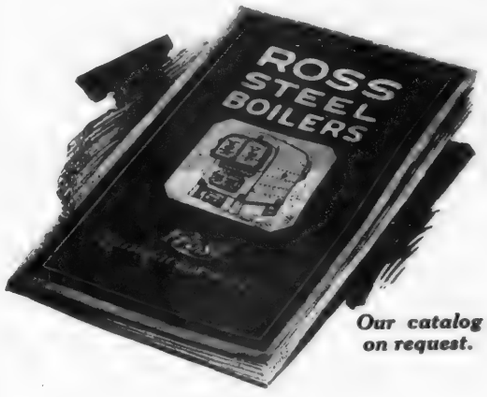
ROSS BOILERS

have lung power sufficient to allow complete combustion.

THE RESULT

is a clean, smokeless furnace that is economical in fuel—either low grade coal or oil—and one that needs little cleaning or operating attention.

ROSS Boilers are made in 30 sizes. Capacities from 400 to 27,000 ft.



Our catalog on request.

There are ten reasons why ten patented features in ROSS Boilers result in the production of a SUPERIOR BOILER.

The Frost Manufacturing Co.

—Since 1851—

Main office and works 1520 HENDERSON ST., GALESBURG, ILL.

New—yet old

Fitzgibbons-Ontario

Small Steel Boilers

Now residences, churches, garages and other small buildings can be heated as economically and efficiently as large buildings. For, owing to increased manufacturing facilities and modern machinery, we are also manufacturing Fitzgibbons-Ontario Steel Boilers in sizes ranging from 400 to 3200 sq. ft.

The smallest size is only 4′ 7″ high, 5′ long and 2′ 2″ wide. It will go through the average door and can be installed where space is limited. In these small-sized Fitzgibbons-Ontario Steel Boilers will be found the same refinements of design and the same high-grade materials and workmanship that have gained for the large Fitzgibbons Steel Boilers such an enviable reputation during the past forty years. The name "Fitzgibbons" has never been put on a boiler that was not of the very highest quality. Since 1886 this name has stood for *guaranteed* satisfaction.

Fitzgibbons-Ontario Boilers are constructed in one piece. No time wasted bolting sections together, puttying cracks and doing other unnecessary work. Moreover, they are built entirely of rust-resisting *copper-steel*, assuring a lifetime of service. Tests conducted by reliable authorities have proven the unusual durability of copper-steel. And, with all their advantages, Fitzgibbons-Ontario Boilers cost but little, if any, more than ordinary cast-iron boilers.

They are made for steam, vapor and hot water and burn any kind or size of coal or oil.

Our interesting booklet sent on request

Some Advantages

Effect fuel savings of about 40%.

Require little floor space.

Are exceptionally easy to fire.

Heating surfaces can be cleaned in 5 minutes.

Cost practically nothing for upkeep.

Made of rust-resisting **copper steel.**

Are the lowest-priced boilers to insure.

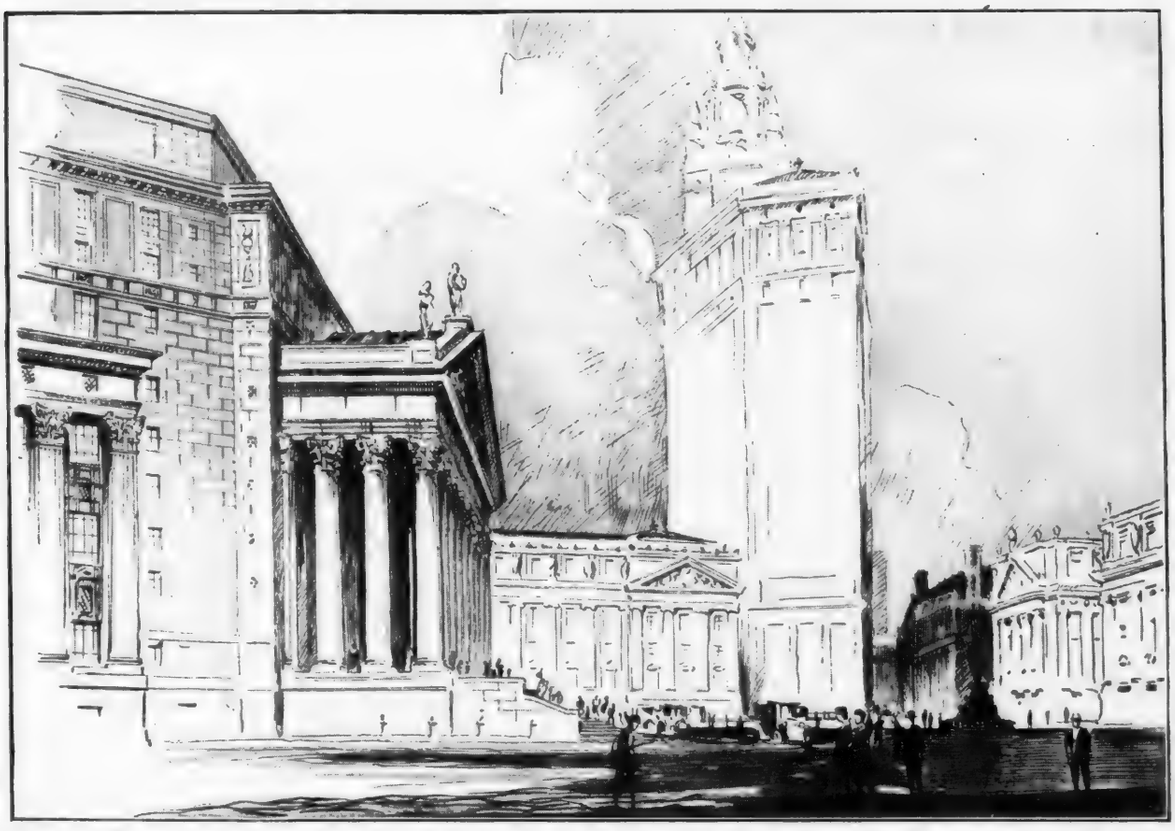
Made in one piece—nothing to assemble.

Built in accordance with A. S. M. E. and State Boiler Codes.

Ratings are **net** and give the amount of equivalent cast-iron radiation that the boiler will heat.

FITZGIBBONS BOILER CO., Inc.

570 Seventh Ave., New York City



New York County Court House, New York, N. Y. Architect, Guy Lowell, New York; Consulting Engineers, Clark, McMullen & Riley, New York; Heating Contractors, Baker, Smith & Co., New York; Blower System, Massachusetts Blower Company

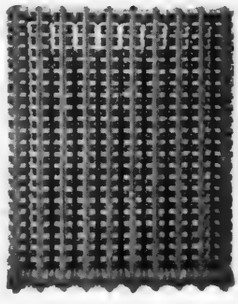
19,200 feet of Vento in New York County Court House

The New York County Court House is completely equipped with Vento Cast Iron Heaters.

Vento Heaters were selected for this type of installation because they have been proven so dependable under all kinds of tests—because they withstand all the elements found in heating and ventilating, cooling, air-washing, humidifying and drying processes—and because they are permanently tight.

Where Vento sections have replaced other forms of heaters employed as tempering or re-heat units they have ended all freezing and other difficulties.

We shall be glad to send you our "Engineers' Data Book on Vento," in which are tables showing the results of the most thorough tests ever applied to Blast Heaters.



A typical stack of Vento Cast Iron Heaters

AMERICAN RADIATOR COMPANY

Showrooms and sales offices: New York, Boston, Providence, New Haven, Newark, Philadelphia, Baltimore, Washington, Richmond, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Atlanta, Chicago, Milwaukee, Indianapolis, St. Louis, St. Paul, Minneapolis, Omaha, Kansas City, Denver, San Francisco, Los Angeles, Seattle, Toronto, London, Paris, Milan, Brussels, Berlin

Makers of IDEAL BOILERS *and* AMERICAN RADIATORS *and other products for heating, ventilating and refrigeration*

Have You Considered the Economy of Short Tie Bolts?

Have You Considered the Economy of Short Tie Bolts?

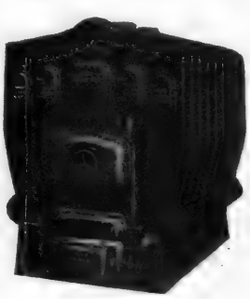
Sometimes we overlook a little thing and suddenly discover it to be a big one—in results. Take the Burnham short tie bolt, for instance.

Here are two fairly intelligent men, setting up a Burnham Square Sectional Boiler, with the assurance of getting everything right, and only an ordinary amount of physical effort.

Each section fits exactly in place, and is firmly bolted to stay.

No waiting until all sections are in place—no bothersome long bolts to adjust nor chance of sections slipping out of position in the process.

Taken together with the well known Burnham record as heat producers, this short bolt feature is a clincher with harassed heating engineers.



It saves you time and labor on the job, while delivering a better type of boiler and a more dependable grade of heating service.

Write for the Burnham Book of Boiler Facts.

Burnham Boiler Corporation

Irvington, N. Y.

New York Office: 30 East 42nd Street

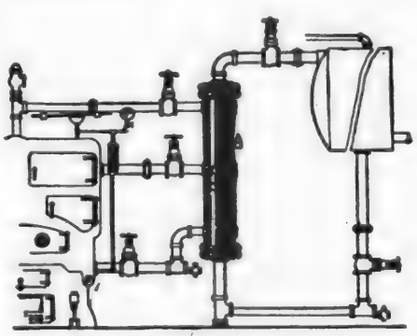
Representatives and Branch Offices in Principal Cities

Taco Semi Indirect pays for itself by the fuel it saves

This important addition rounds out the TACO products so that there now is a TACO which can be attached to every heating installation, whether small or large, to heat water from the heating boiler and save fuel.

The economy resulting from the use of TACO is made possible by there being required one fire in place of two. Utilizing this fire to heat water during those periods of the day and night when no heat is required in the building makes a further saving as during these periods the fire would otherwise be wasted. As a result of heating water during these off periods, the added boiler tax is reduced to a minimum.

There is also economy when an oil burner is used—by using the one set of equipment in place of two. The TACO SEMI INDIRECT, using both the water of the steam heating boiler and the steam, gives the economy of an indirect heater together with the quick heating from the portion exposed to steam. This is particularly desirable when heating water in combination with an oil burner, as well as on large installations.

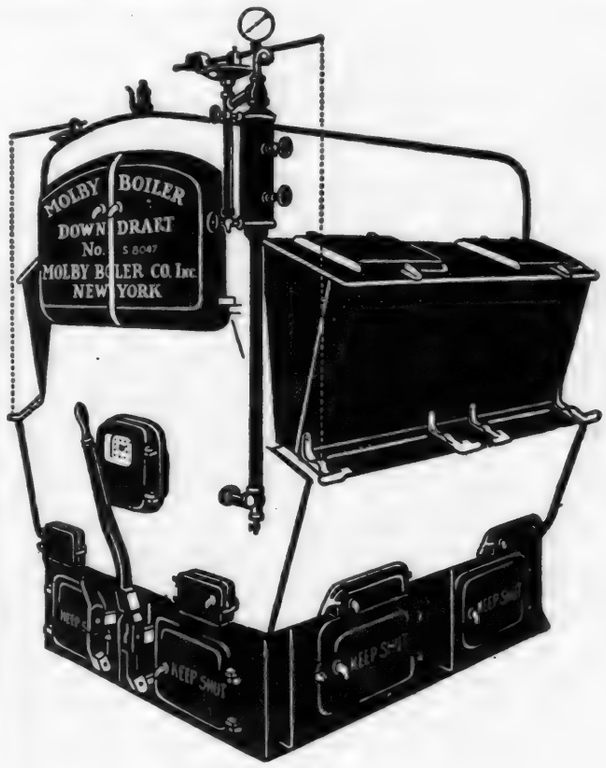


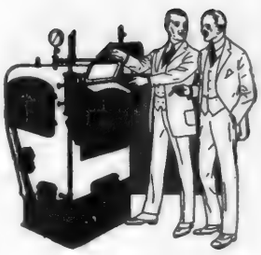
INSTALLATION DIAGRAM

Thermal Appliance Company
342 Madison Ave., New York

Coal Bills cut more than 50%...

and in the coldest weather coal only twice a day





ECONOMY AND EFFICIENCY

1. **Burns No. 1 Buckwheat** Anthracite. No mixing with expensive larger coal.

2. **Magazine-feed** needs filling only every 12 to 14 hours in severe winter weather.

3. **No forced draft. No accessories.** Downdraft-crossdraft an exclusive feature. No waste of heat units.

4. **For homes and large buildings.** Steam, vapor and hot water, and hot water supply.

5. **Steam and vapor sizes** from 500 to 7750 sq. ft. Hot water sizes from 850 to 12925 sq. ft.

1776–1926
PHILADELPHIA
SESQUI-CENTENNIAL

"Expositions are the Milestones of Progress"

—

BE sure to visit the Molby exhibit, in the Government Exhibits Palace Number 5.

This Molby owner does it. Read what he says—

(Name on Request)

"The following figures will interest you as much as they please us:"

					Monthly Coal Bills Old Heaters			Monthly Coal Bills Molby Boilers
456-8 Mott Ave.		5	tons	Stove Coal	$70.00	5	tons No. 1 Buckwheat	$32.20
2351	Concourse	2½	"	"	35.00	2¼	"	14.40
2355	"	2	"	"	28.00	1½	"	9.60
2331	"	2	"	"	28.00	1½	"	9.60

The MOLBY HEATING BOILER

burns No. 1 Buckwheat

Send for catalog illustrating and describing our complete line of various types and sizes of Molby magazine-feed downdraft-crossdraft low pressure boilers and heavy duty tank heaters especially designed to burn the smaller and cheaper sizes of anthracite.

MOLBY BOILER COMPANY *Incorporated*
CENTRAL RADIATOR COMPANY, *Distributors*
(Subsidiaries of The Universal Pipe and Radiator Company)
New York: 41 East 42nd Street Lansdale, Pa., 41 Central Avenue

UNIVERSAL

"SMOKE PREVENTING"

Cast-iron Water Tube

Single Grate

Steam and Hot Water

Heating Boilers

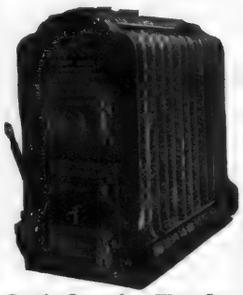
will give years of satisfactory Heating Service and are Fully Guaranteed

We guarantee our boilers to satisfactorily handle a load equal to 50% of the rating shown below. Piping should be included.

This guarantee is based on using bituminous high volatile coal similar to "Pittsburgh Vein" run-of-mine. Firing period four hours in zero weather.

The long vertical water tubes make our boilers largely SELF-CLEANING.

The high crown sheet makes it possible for the fire to travel over the high temperature cement baffle section and NOT under it. This enables a larger bed of fuel to be carried with a longer firing period and expert or careful firing is not necessary.



Single-Grate, Low Water Line (Patented)

"Smoke-Preventing"

Equipped with hot blast oxidizing tuyeres, and high temperature cement baffle section.

24" SINGLE-GRATE, UP-DRAFT. "SMOKE-PREVENTING"

Water-line 47 in. Width overall 36 in. Height overall 57 in.

Steam Boiler No.	Steam Rating	Total No. of Sections	Grate Area	Water Boiler No.	Water Rating
S-531	2160	6	3.00	W-531	3460
S-541	2880	7	4.00	W-541	4600
S-551	3600	8	5.00	W-551	5760
S-552	3900	9	5.00	W-552	6240
S-553	4200	10	5.00	W-553	6720
S-562	4320	10	6.00	W-562	6900
S-572	5040	11	7.00	W-572	8000
S-573	5400	12	7.00	W-573	8600
S-582	5760	12	8.00	W-582	9200
S-592	6480	13	9.00	W-592	10360
S-593	6830	14	9.00	W-593	10920

36" SINGLE-GRATE, UP-DRAFT. "SMOKE-PREVENTING"

Water-line 48 in. Width overall 49 in. Height 60 in.

Steam Boiler No.	Steam Rating	Total No. Sections	Grate Area	Water Boiler No.	Water Rating
S-331	4000	6	5.60	W-331	6400
S-332	4675	7	5.60	W-332	7500
S-342	5350	8	7.45	W-342	8560
S-343	6000	9	7.45	W-343	9600
S-352	6650	9	9.25	W-352	10640
S-353	7100	10	9.25	W-353	11360
S-354	7550	11	9.25	W-354	12080
S-362	8000	10	11.10	W-362	12800
S-363	8450	10	11.10	W-363	13520
S-364	8900	12	11.10	W-364	14240
S-373	9350	12	12.95	W-373	14960
S-374	9800	13	12.95	W-374	15680
S-375	10200	14	12.95	W-375	16320
S-383	10650	13	14.8	W-383	17040
S-384	11100	14	14.8	W-384	17760
S-385	11550	15	14.8	W-385	18480
S-394	12000	15	16.65	W-394	19200
S-395	12450	16	16.65	W-395	19920
S-396	12900	17	16.65	W-396	20640
S-397	13350	18	16.65	W-397	21260

Universal Smokeless Boiler Co.

Ravenna, Ohio

The New Improved Packless Graduated Supply Valve

WITHOUT A SINGLE COMPROMISE

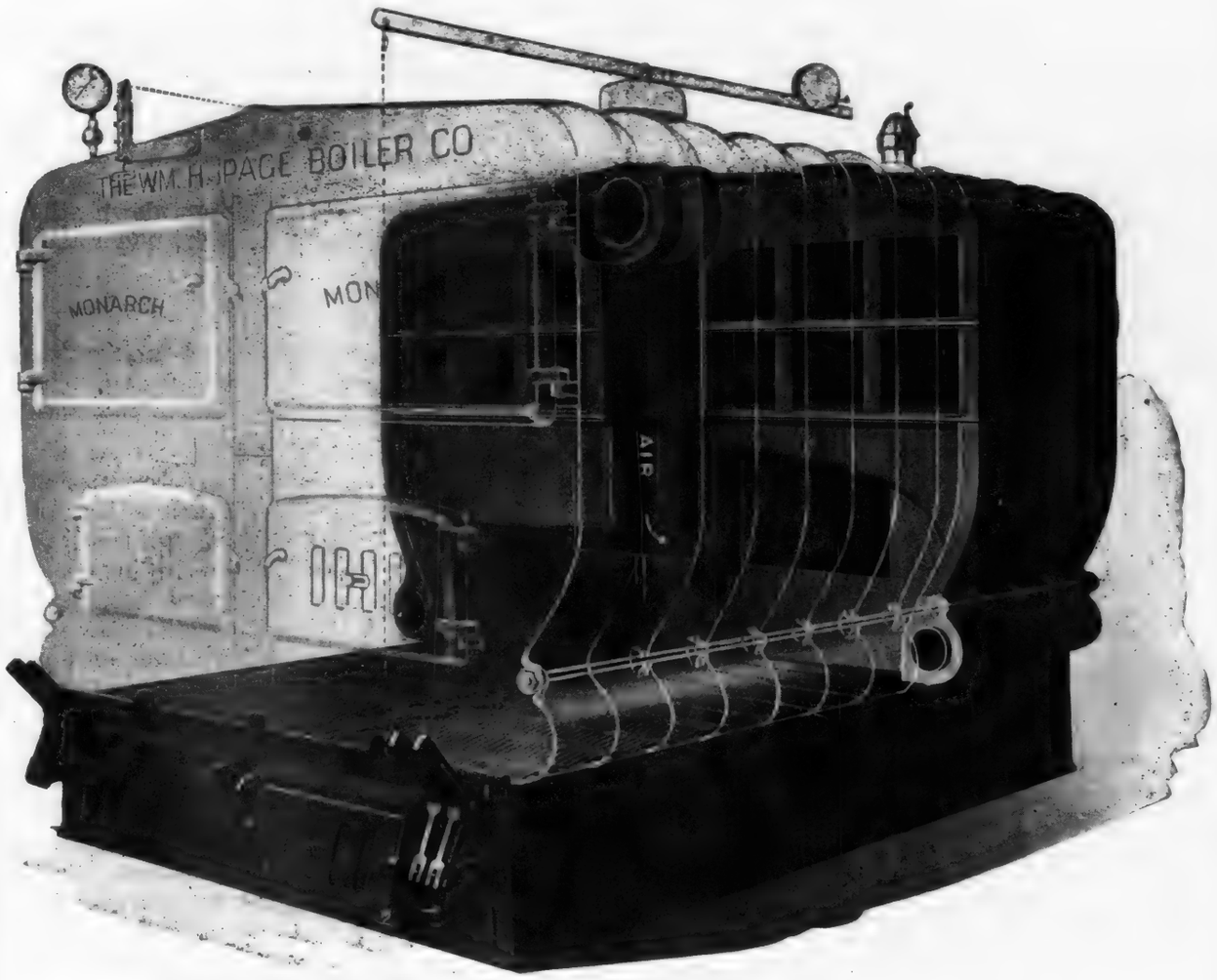
Embodies *all* the desirable features that 35 years experience in valve design and construction was possible to incorporate.

When those who select the mechanical equipment for any building look about for a valve that embodies pleasing design — lasting permanence — combined with a ruggedness, that will stand, installation punishment—they just naturally gravitate towards the Improved "O-E" Packless Valve.

Ask us about our new 1-X and 1-W Finish

O-E SPECIALTY MFG. CO.

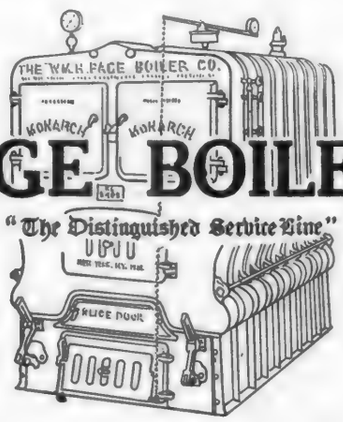
12 Keefe Ave., Milwaukee, Wis.



Monarch 60″ Smokeless Boilers—constructed on the sound basic principles that have assured the success of Page Boilers since 1856, when the first square sectional cast iron boiler to be manufactured in the United States was introduced—have again demonstrated, since they were placed on the market, the extent of real heating satisfaction and economy that may be realized.

Burn soft coal, *smokelessly,* utilizing all the combustible. Highly efficient and economical when fuel is hard coal, coke or oil.

60″ grate. 60″ water line. Capacities to 29000 sq. ft., steam. Write for your copy of Catalogue No. 52.



PAGE BOILERS

THE WM. H. PAGE BOILER CO.

200 Madison Avenue

NEW YORK

BOSTON **CLEVELAND**
PHILADELPHIA **MEADVILLE**

Established 1856 **Incorporated 1876**

EACH RADIATOR AN INDEPENDENT STEAM HEATING PLANT

Kesbec Oil Station, Riverside Drive, New York

Two Heating Systems in the Same Number of Radiators

Two for one is good trading. It is also good heating if, in the standard heating system, there is also a heating system that is ideal for the cool days of fall and spring.

That is what Combination Heating Systems offer.

The Clow "Gasteam" Radiators are a part of the standard steam heating plant. They act as ordinary radiators while the heating plant is running. But also they are available for heating the rooms in which they are placed when the heating plant is shut down.

The boiler can be started a month or two later in the fall and shut down a month or two earlier in the spring.

Clow "Gasteam" Radiators can be furnished for either vacuum or vapor, one or two pipe systems. Also Clow "Gaswater" Radiators for hot water systems.

JAMES B. CLOW & SONS
201-299 N. Talman Ave., Chicago
Offices in Principal Cities

CLOW
GASTEAM — GASWATER

"RIDE" THIS WINNER!

Thundering hoofs flying down the home stretch—they flash under the wire—

One winner—only one.

Selling oil burners is not unlike the thrilling sport of horse racing. The speed of the horse is akin to the sales features of the burner.

On this premise the Combustion Fuel Oil Burner has all the qualities of the one "Winner". Gives you the lead in your community. Opens two big sales outlets—domestic and industrial heating. Adaptable to both. May be used with any hot air furnace or any boiler. Completely automatic, yet burns genuine fuel oil. Simple—only 3 moving parts. Dependable—a big success for over 6 years. Thousands in use.

Fifteen outstanding features give you sales clinching points that can't be matched in the race for business. Dealers all over the country are beating out competitors with the Combustion.

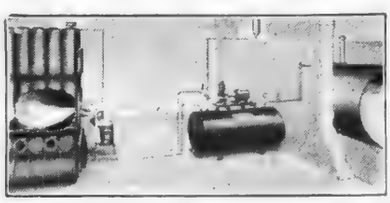
Double Franchise

With the Combustion, we also offer the franchise for the Milwaukee Air Power Water System which delivers water under high pressure any distance, direct from the source. The only system with the famous double cylinder air power pump.

Write today for complete information.

COMBUSTION FUEL OIL BURNER CO.
13 Keefe Ave. Milwaukee, Wis.
Subsidiary of Milwaukee Air Power Pump Co.

The Combustion Fuel Oil Burner



You will want to have copies of this book for your customers

INTENDED originally to clarify many phases of the heating problem to the layman, there are many chapters in this book which will assist you in explaining the technical reasons for your recommendations.

Some of the most interesting chapters that will help you simplify phases of this important problem are: —

How Much Should the Heating System Cost in Relation to the Total Building Investment?

What Part in the Operating Budget?

Heat for the Home

Heating Systems

Heat for Other Kinds of Buildings

Fuels

You may have as many copies as you wish to give to your customers, or we shall be glad to mail them directly to them in your name.

Spencer

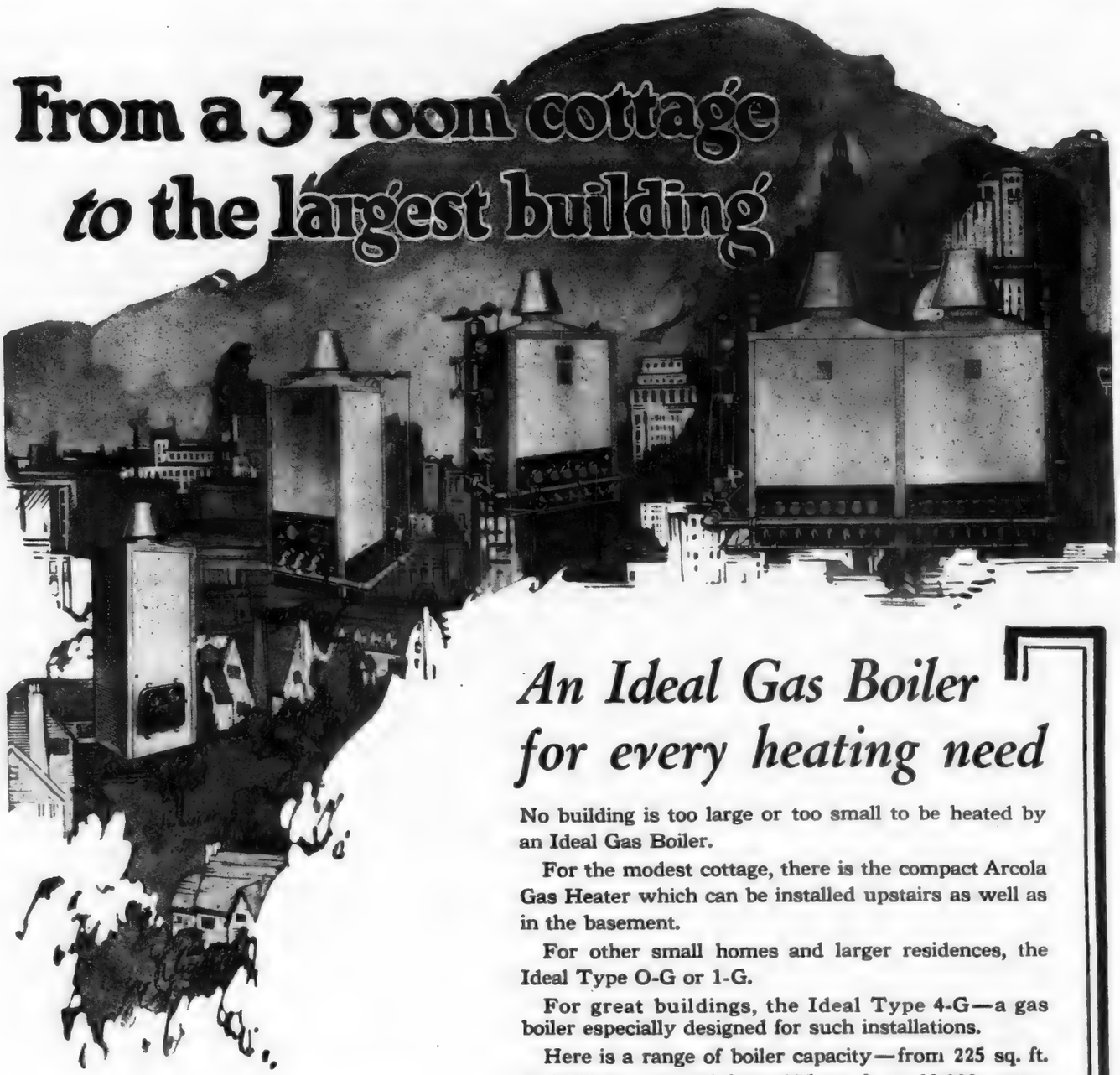
steam, vapor or hot water Heater

burns No.1 Buckwheat coal

SPENCER HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.

New York City Boston Philadelphia Baltimore Buffalo Rochester Hartford Washington Detroit Albany Syracuse Harrisburg Scranton

From a 3 room cottage *to* the largest building



Are you prepared to get your share of profitable business in this rapidly growing new field of modern heating?

You can if you make yourself known as the man who installs Ideal Gas Boilers.

Let your Gas Company tell you about it or clip out the coupon and send it to us.

An Ideal Gas Boiler for every heating need

No building is too large or too small to be heated by an Ideal Gas Boiler.

For the modest cottage, there is the compact Arcola Gas Heater which can be installed upstairs as well as in the basement.

For other small homes and larger residences, the Ideal Type O-G or 1-G.

For great buildings, the Ideal Type 4-G—a gas boiler especially designed for such installations.

Here is a range of boiler capacity—from 225 sq. ft. to 8,000 steam; and from 375 sq. ft. to 13,000 water.

Ideal Gas Boilers are tested and rated according to the code of the American Gas Association. Approved by the laboratories of the country's leading gas companies, their record of past performance assures you of satisfactory service.

AMERICAN GAS PRODUCTS CORP.
376 Lafayette Street, New York City

GENTLEMEN: Please send me your Advertising Campaign Plan Booklet.
Yours very truly,

Name_____

Address _____

City_____ State_____

IDEAL GAS BOILERS

Product of the AMERICAN RADIATOR COMPANY

American Gas Products Corporation

376 Lafayette Street DISTRIBUTOR New York

SALES OFFICES:
BOSTON PHILADELPHIA ST. LOUIS
BUFFALO JACKSONVILLE KANSAS CITY
CHICAGO SAN FRANCISCO

MANY SMALL UNITS
heat more quickly than ONE LARGE MASS

Cut of the sections that break up the water and "stagger" the fire travel

That is the principle which makes the Thatcher Round Boiler the most powerful of all house heaters for rated capacity; in both the number of thermal units transmitted to the water and the length of time between firings.

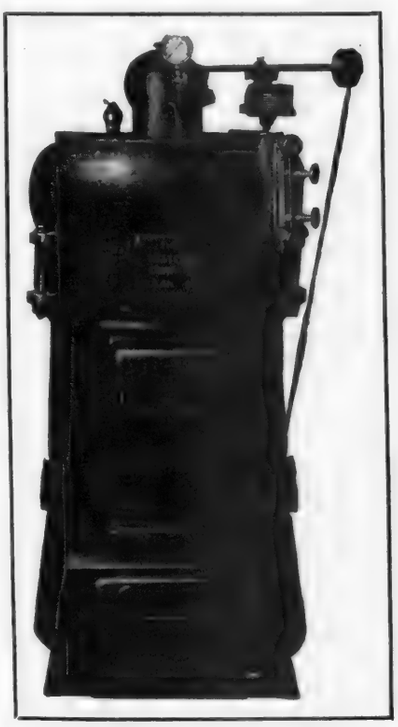
Staggered Fire Travel

The ingenious construction of the sections shown above and their position in the boiler divide the mass of water into many small parts. They also "stagger" the fire travel, so that the full effect of the heat is exerted below, above and beside each unit.

Less fuel is required than in an ordinary boiler, and the radiators begin to "sing" soon after a fire is started in a

THATCHER ROUND BOILER

Among the many selling points of the Thatcher Round Boiler easily demonstrated to a house-owner are the three main features which appeal particularly to him—its small coal consumption, quick, ample heat, and ease of operation.



Steam and Hot Water Heating

Whichever your customer fancies, it makes no difference; there's a type and size of Thatcher to suit him exactly. And the boiler has many other points that will appeal to him.

The Triangular Revolving Grates, for the easy disposal of clinkers; the deep Fire-Pot, making frequent firing unnecessary; the unusually high ash-pit, which allows plenty of room for the convenient removal of ashes and prevents the grates from being burned out.

Grate Surface Flue Area and Water Circulation all Efficiently Equalized

Seven Decades of Service

Thatcher Boilers and other products have a reputation built on more than seventy-six years of satisfaction afforded to both house owners and dealers.

Mail coupon for printed matter and full information regarding our line.

THE THATCHER COMPANY
formerly Thatcher Furnace Co.
Since 1850

Chicago	Newark	New York
341 N. Clark St.	39-41 St. Francis St.	21 W. 44th St.

THE THATCHER COMPANY,
39-41 St. Francis St., Newark, N. J.
Please send printed matter and full information regarding your line.
Name .....
Address .....

THATCHER
BOILERS-FURNACES-RANGES

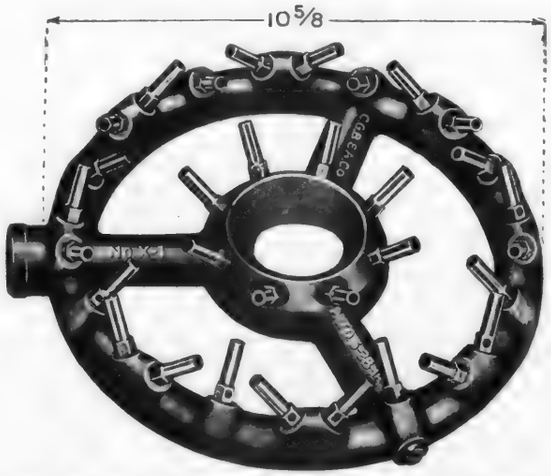
BARBER PATENTED JET GAS BURNERS

Are Always Used in Furnaces, Steam and Hot Water Boilers, Hot Water Heaters and other Heating Appliances when Economy, Cleanliness, Convenience and the Highest Efficiency are Desired—BECAUSE

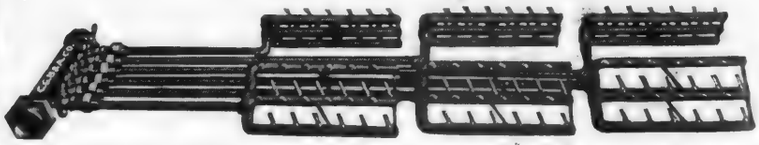
BARBER Patented JET GAS BURNERS

Reduce gas bills 25 to 40%. Act as their own pilot lights. Can be controlled with any good thermostat. Develop 1960 degrees Fahr. with 500 B.T.U. gas. Cannot be affected by corrosion or condensation. Will not back-fire, or deposit carbon—on any pressure. Require no adjustment, regardless of pressures or quality of gas. Produce an orange-green flame with Artificial, Natural or Mixed gases.

There is a size and type of Barber Burner for every heating appliance. Furnish us with the Trade Name, Number and Name of Manufacturer, and we will promptly specify proper burner equipment.



The "X-10" Standard Barber Patented Jet Burner Unit illustrated above—is shown properly installed in the average round Hot Air Furnace with a cast iron dome. This unit is of sufficient capacity to heat up to seven average size rooms in zero weather upon a one ounce gas pressure.



Illustrating a Special Barber Patented Jet Gas Burner, made up of six "U-24" burner units—properly installed in a Sectional Steam or Hot Water Boiler primarily designed for the burning of coal. The burner may be quickly installed or removed, as each gas supply line from the manifold is connected with a separate valve and union.

Write for Catalogue, Literature and Discounts. Start now to increase your SALES and PROFITS.

The CLEVELAND GAS BURNER & APPLIANCE CO.

Burner Specialists

3702-04 Superior Avenue, Cleveland, Ohio

12 Years Without A Leak

The giant Equitable Building in New York, one of the largest office buildings in the world, is a fitting tribute to the superiority of ***National Push-Nipple Radiation.*** In the whole of this huge structure, warmed by more than 40 carloads of National Push-Nipple Radiation, there was not a leak in a single radiator when the heating system was tested, nor has a single leak developed during more than 12 years of service.

Assembled as Aero Radiators are, with Malleable Cast-Iron Push-Nipples finished to .001 of an inch for accuracy, the nipple connections are mechanically perfect. The Push-Nipple or iron-to-iron joint does not depend upon a paper gasket for tightness. The joint is made by the contact of the nipple with the bored or reamed opening in the radiator section. Once tight, it is always tight and when Malleable Cast-Iron Push-Nipples are used, this joint will last as long as the radiator section.

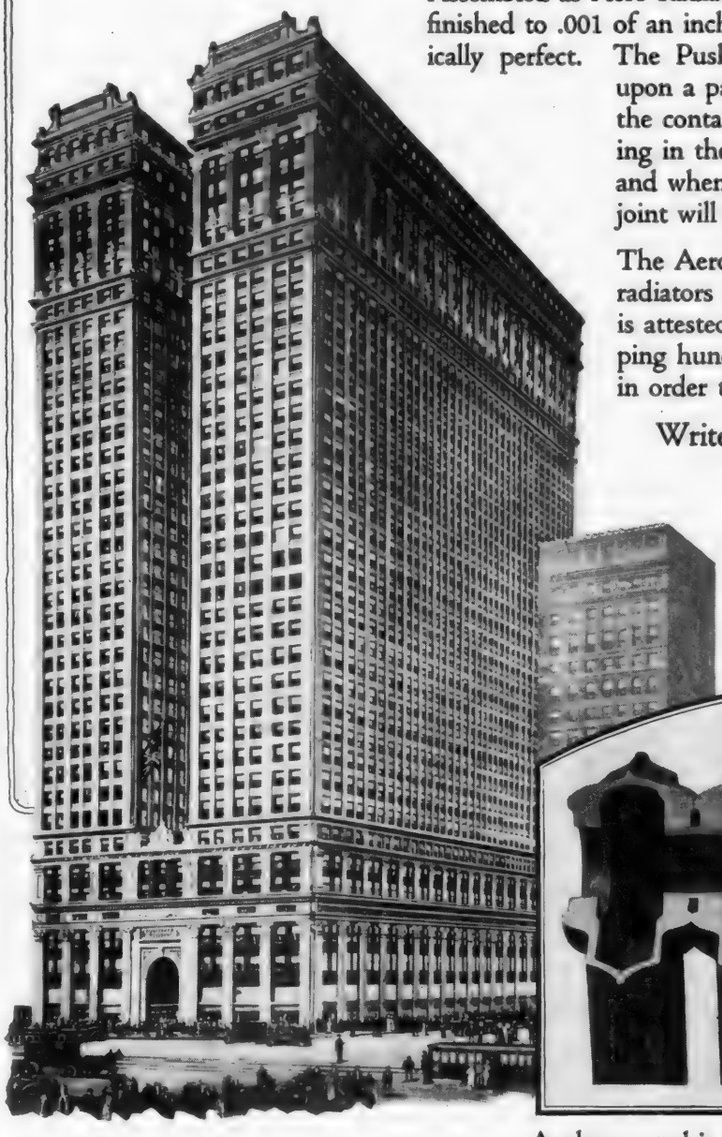
The Aero is the first and only complete line of new type radiators on the market. That it is the ***radiator vogue*** is attested by the fact that other manufacturers are scrapping hundreds of thousands of dollars worth of equipment in order to produce a radiator similar in type.

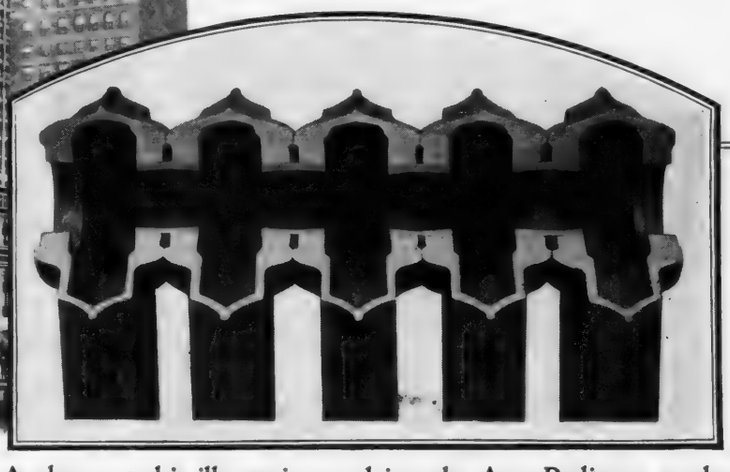
Write for literature and discount sheets today.

NATIONAL RADIATOR COMPANY

JOHNSTOWN, PA.

PLANTS: Johnstown, Pa. New Castle, Pa. Trenton, N. J.
BRANCH OFFICES: New York Philadelphia Baltimore
Washington Richmond Pittsburgh Cincinnati
Cleveland and Chicago





A glance at this illustration explains why Aero Radiators render consistently good service. The Push-Nipple Radiator appeals to the Heating Engineer on account of the ease with which such a radiator can be torn apart and reassembled on the job.

BEAUTY *and* WARMTH *with*

AERO RADIATORS

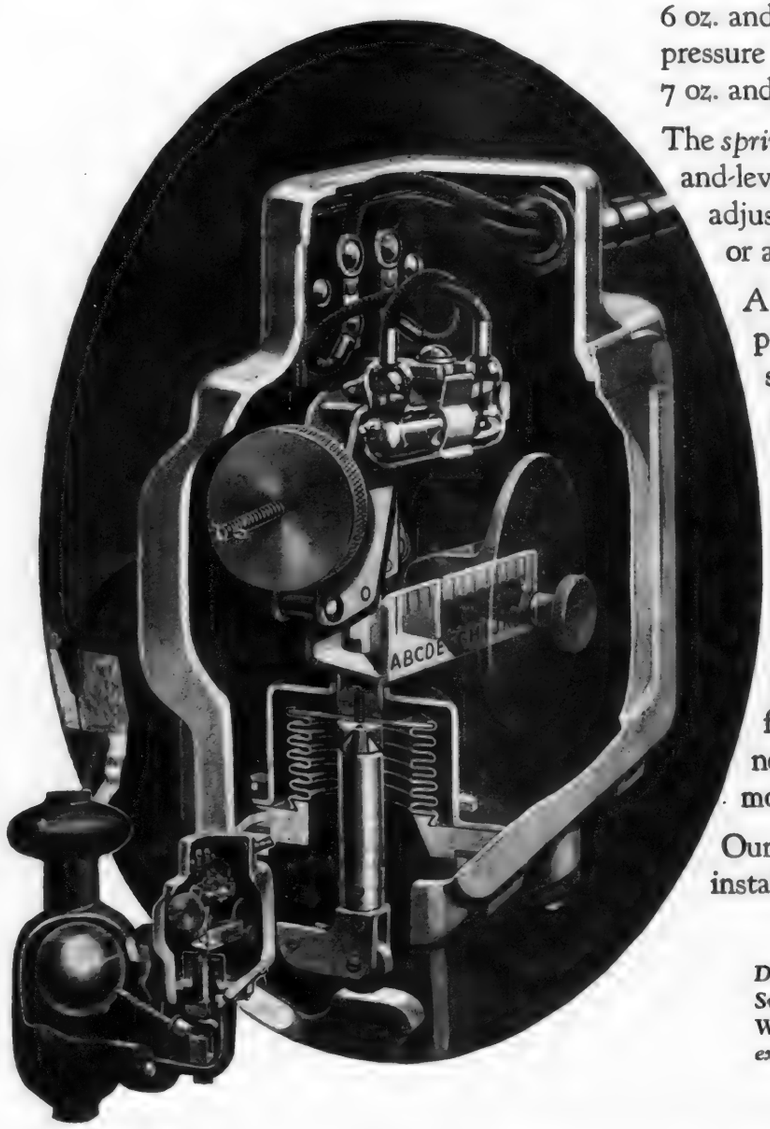
Pressure Control and Low Water Cut-Off in a Single Unit

McDonnell & Miller

Duplex Switch

Low Water and Pressure

"Sensitive as a fine watch—yet sturdy as the motor which it controls"



THE McDonnell & Miller Duplex Switch is a combined Pressurestat and Low Water Cut-off.

When the boiler water line drops to the bottom of the gauge glass, the Duplex Switch cuts out the burner motor until there is at least one inch of water in the glass, when it automatically cuts it in again. It eliminates the usual pressure control because it controls the boiler pressure more accurately than any other similar instrument. It may be easily adjusted for any cut-out pressure from 9 oz. to 10 lbs. 6 oz. and the difference between cut-out and cut-in pressure may be varied at will anywhere between 7 oz. and 5 lbs. 8 oz.

The *springless* movement is operated on the weight-and-lever principle. It is permanently accurate in adjustment because springs, either for actuating or adjusting, have been eliminated.

A single unit covers the whole range of low pressure steam heating requirements. The same unit which you install on a pressure system could be removed and used on a vacuum system by making a simple adjustment—without tools. It can be connected to any low pressure boiler in less than an hour.

Perfect pressure regulation and positive insurance against boiler damage are important factors in the satisfaction that is derived from your oil burner. You can't afford to neglect either—both may be had at but little more than the cost of pressure regulation alone.

Our folder H9 gives details of construction, installation and operation. Send for it.

Do not confuse the McDonnell & Miller Duplex Switch with the McDonnell & Miller Duplex Water Feeder. Our booklet "Defining the Field" explains our reasons for building separate units.

McDonnell & Miller

BOILER CONTROLS

General Offices • WRIGLEY BUILDING • CHICAGO

Read

what users say

about

COIL

STEEL HEATING BOILERS AND WATER HEATERS

For Oil or Coal Fuel

"With the Coil Boiler and the..... Oil Burner, the combination has saved me both money and worry."

"We have the three Boilers (Oil Burning) which went into the three submarines V-1, 2 and 3, two of which are equipped and in use and working very satisfactorily."

"Coil Boilers have proved all that you claimed, and more. It would be hard to overpraise them. ..... is saving lots of oil."

"I have used hot water boilers of other types for the past 20 years and I believe your boiler is the most efficient one I have ever had."

"My Boiler has worked perfectly. Am using an ..... Oil Burner and would not part with the combination."

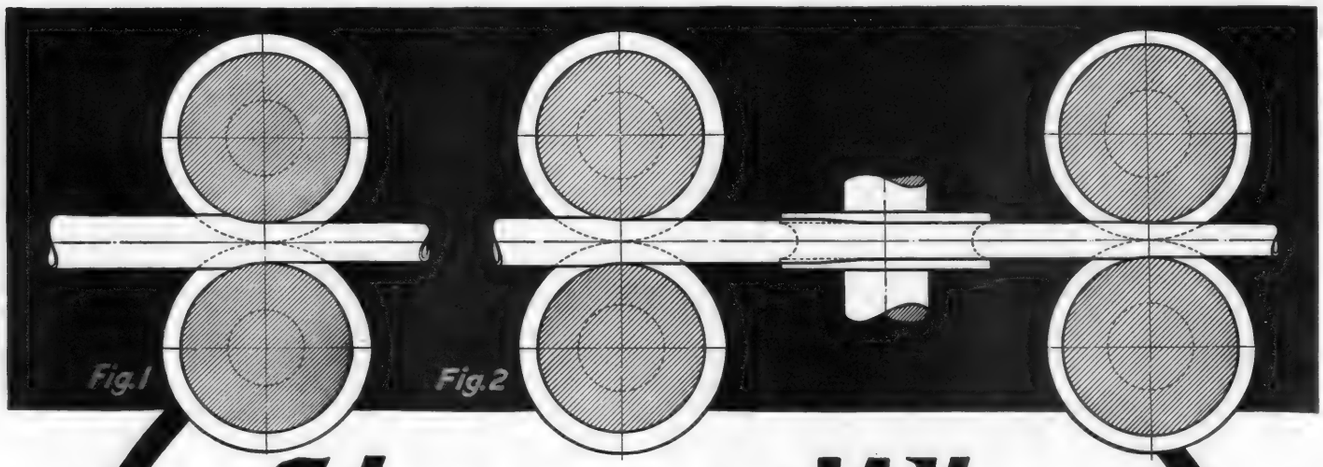
"Your boiler and the ..... Oil Burner have given me what I wanted both in economy and sure heat."

These are a few random extracts from letters written to us by enthusiastic users of COIL Boilers. Wherever economical hot water or steam heat is needed a COIL Boiler will produce results far exceeding the expectations of your customers.

Full details regarding COIL Boilers and names of COIL installations furnished on request.

MONITOR BOILER COMPANY

1505 Race Street :: Philadelphia, Pa.



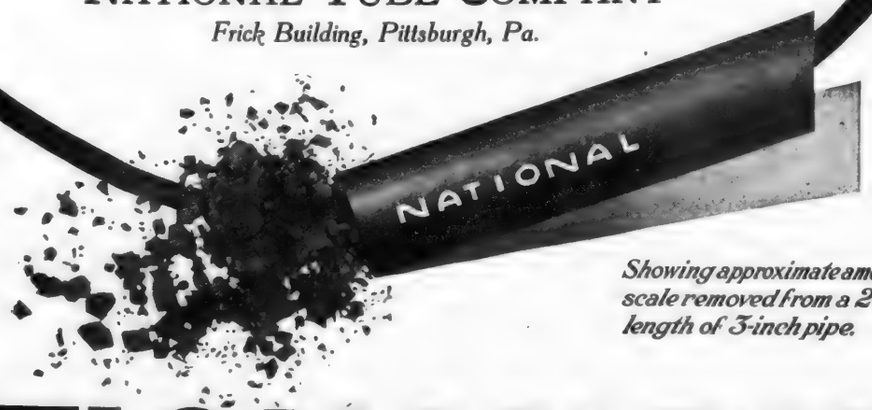
How and Why
"NATIONAL" Butt-weld PIPE is made free from scale

THE welding-scale, or mill-scale, which forms on skelp in the welding furnace, is removed from "NATIONAL" Butt-weld Pipe (sizes ½ to 3-inch) by a process that is entirely mechanical. While still hot from welding, the pipe is reduced slightly in diameter by passing through the rolls shown in Fig. 1, which loosen the scale somewhat. It is allowed to cool slightly, and then passed through another set of rolls shown in Fig. 2 (diagrams exaggerate reduction). These last rolls further reduce the diameter, and in doing so, the scale, which has become brittle while cooling, is fully loosened and falls from the pipe walls. The last pair of rolls gives the pipe its proper diameter and true circular shape. After further cooling, the loose scale is blown out by compressed air or washed out with water.

By removing this scale, a clean, smooth surface is obtained for galvanizing or other coatings; friction losses caused by rough interior surfaces are reduced and increased working capacity of the pipe is obtained; clogging of pipe, valves, restricted orifices and delicate apparatus by loose scale is practically eliminated and any tendency to corrosion, especially in the form of pitting, is minimized. For details of this process and its advantages, write for a copy of "NATIONAL" Bulletin No. 7.

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.



Showing approximate amount of scale removed from a 20-foot length of 3-inch pipe.

Only "NATIONAL" PIPE IS MADE BY THE SCALE FREE PROCESS

PULVERZONE

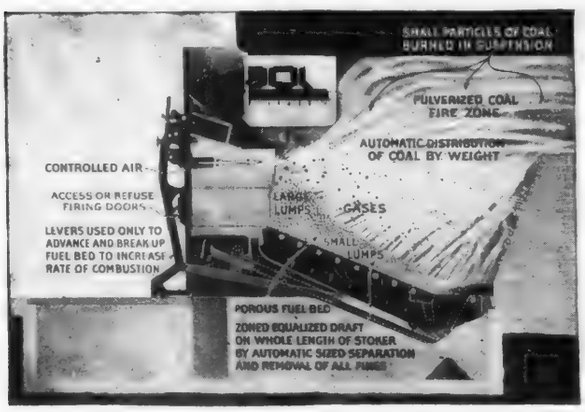
Combines Three Methods in One in the World's Simplest Stoker

Embodies the BEST elements of

1—PULVERIZED COAL BURNING
Instantaneous ignition of the fine particles in suspension without danger of explosion

2—SPREAD METHOD
(Light and Continuous) by automatically separating, grading and distributing of coal sizes by weight.

3—COKING METHOD
The Standard CoKal Stoker fuel bed provides the intense heat necessary for burning the fines and the spread coal.


SMALL PARTICLES OF COAL BURNED IN SUSPENSION
PULVERIZED COAL FIRE ZONE
AUTOMATIC DISTRIBUTION OF COAL BY WEIGHT
CONTROLLED AIR
ACCESS OR REFUSE FIRING DOORS
LARGE LUMPS
GASES
SMALL LUMPS
LEVERS USED ONLY TO ADVANCE AND BREAK UP FUEL BED TO INCREASE RATE OF COMBUSTION
POROUS FUEL BED
ZONED EQUALIZED DRAFT ON WHOLE LENGTH OF STOKER BY AUTOMATIC SIZED SEPARATION AND REMOVAL OF ALL FINES

(M) MIXTURE, (A) AIR, (T) TEMPERATURE, (T) TIME—the four cardinal, scientific requirements for perfect combustion of coal—are all incorporated in the PULVERZONE as well as (a) pulverized coal burning, (b) spread method and (c) coking method.

Superior to any other coal burning apparatus—the PULVERZONE is revolutionizing coal burning wherever installed—in small, medium size and large plants—because of these outstanding advantages:

Absolutely Smokeless
Abnormally High Efficiencies
Instantaneous Response to Load Changes
Huge Overloads
Perfect Combustion
No Pulverizing Necessary
Uses Standard Screenings (Wet or Dry)
No Explosion Hazard
No Slagging
Eliminates All Cleaning Periods
Fires Can Be Banked

All boilers from 50 up to 2000 hp. can be easily equipped with the PULVERZONE at low first cost.

Ask for the facts—and full particulars

CoKal Stoker Corporation

1014 Wrigley Building, Chicago

Buffalo **Kansas City** **New York City** **Philadelphia** **Pittsburgh** **[St. Louis**

Dependable

THIS one word sums up the true worth of the Webster Ignition Transformer • • • Every phase of its performance, every factor of its construction indicate unfailing dependability • • • It was designed and developed especially for oil burner use • • • • • Oil burner manufacturers will be interested in the five outstanding features which insure this dependability • • • The Webster sales department will tell you about them on request and the Webster engineering department will cooperate with you in adapting this transformer to your product • • • • • • • •

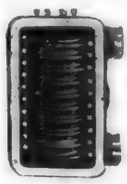
The Webster Ignition Transformer can be furnished with either single or double high tension terminals.

WEBSTER ELECTRIC COMPANY, *Racine, Wisconsin*
"Specialists in Oil Burner Ignition"

Webster Ignition Transformer

STORAGE WATER HEATER
Steel Shell; Copper Coils. Sizes, 200 to 20,000 gals. Ask for Bulletin 74.

FEED WATER HEATER
Standard type; Copper Coils. Sizes, 50 to 5000 BHP. Ask for Bulletin A-5.



FEED WATER HEATER
Improved type for small space requirements. Sizes, 60 to 5000 BHP. Ask for Bulletin B-5.

Dependable

In continuous operation for years, without attention or maintenance charges, Paracoil Steam Specialties are looked upon as dependable equipment in many large industrial plants and on most of the largest ships afloat.

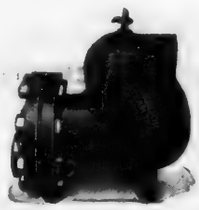
You can be sure of Paracoil products. A responsible firm with 20 years' experience stands back of them.

When you install Paracoil Feed Water Heaters, Steam Traps, Oil Coolers, Grease Extractors, Water Storage Heaters, or other Heat Exchangers, you end maintenance trouble. Each Paracoil product carries a rigid guarantee both as to workmanship and service.

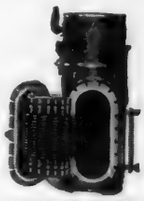
Write for Booklet covering the particular equipment you are interested in.

DAVIS ENGINEERING CORP.
90 West Street, New York City
Factory: Elizabeth, N. J.

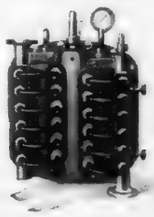
Paracoil
STEAM SPECIALTIES



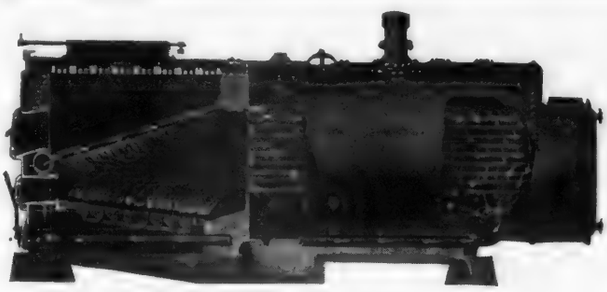
STEAM TRAP
Guaranteed free from repairs for 2 years. Capacities up to 75,000 lbs. per hour. Ask for Bulletin A-12.



EVAPORATOR
Sizes, 1 to 50 tons per 24 hours. Ask for Bulletin A-13.



OIL HEATER
Made in sizes for any capacity required. Ask for Bulletin X.



IMPROVED

This remarkable compact little boiler—needing no outside bricking—without mudlegs or staybolts—possessing an extremely low water line—with a unique system of rapidly circulating water and affording features at points where most boilers develop weaknesses has already demonstrated its great efficiency in thousands of installations throughout the country. And now many refinements in its 17 amazing features contribute a completeness and perfection of which this old established house is justly proud.

The Stanwood Corporation
Cincinnati, O. Est. 1891

Manufacturers also of Horizontal Return Tubular Boilers, Stacks, Tanks, Breechings and Throttling and Automatic Steam Engines.

Improved!

STANWOOD
Smokeless **BOILERS**
WORKING PRESSURES *15 to 200 lbs - SIZES 29 to 210 hp*

Write for detailed pamphlets on this epoch making boiler. 17 features combine to make it a money saver in installation, operation and maintenance.

THE STANWOOD CORPORATION, Dept. D, Cincinnati, Ohio.

Please send me pamphlets describing in detail the Stanwood Boiler.

Name.....

Business.....

Address.....

Setting New Sales Records!

ELECTROL Dealers are Building Profitable Businesses

The growth in Electrol sales, and in the business of Electrol dealers, points directly to the degree of perfection attained in the burner itself.

Electrol Incorporated has developed its product thoroughly before seeking widespread distribution. Now, with a product that has been proved right, to the smallest detail, active dealers are enjoying real success.

Impressive advertising in the two greatest national magazines is behind Electrol dealers—The Saturday Evening Post and the Literary Digest. Every oil-burner prospect is being made to know Electrol as The Master Furnace Man.

There are a few territories open. Yours may be one. Write for information!

ELECTROL INCORPORATED
OF MISSOURI
SAINT LOUIS, U. S. A.

Listed as Standard by the Underwriters' Laboratories

RAYFIELD

PATENTS PENDING

Automatic Fuel Oil Burners

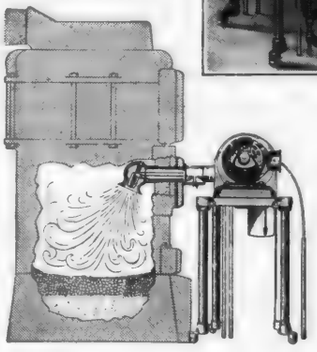
Note These Important Features

1. Utilizes the Radiant Heat Principle.
2. Positive Electric Ignition.
3. Air-cooled, Non-carbonizing Nozzle.
4. Triple Atomization.
5. Double-Length Flame Travel.
6. No Baffling Walls.
7. Really Quiet (not maybe).
8. Rayfield Flame Safety.
9. Latest Minneapolis Controls.
10. Complete Line—5 sizes.
11. Burns Fuel Oil—28/30 For Homes: Lower Gravities for Factories.

Rayfield's Scientific Combustion

Note the illustration. The nozzle is suspended over the fire pot. The vapor, burning in suspension, is forced directly downward to the crushed fire brick at the bottom, then deflected to the sides and rises evenly along the walls of the fire box before the generated heat escapes through the flue. In this manner the flame travels twice the usual distance in the fire box, giving off the maximum heat at the bottom of the fire box and completing combustion before reaching the flue.

The Radiant Heat principle is utilized through the bed of crushed fire brick placed in the ash pit. In operation this brick quickly becomes incandescent, absorbing and holding the heat that would otherwise be lost up the chimney. Long after the burner has been shut off by the thermostat, this white-hot bed of crushed brick continues to radiate its stored heat and thus assists in maintaining an even temperature throughout the building.



The Rayfield is a Super-system of heating designed and developed by Chas. L. Rayfield, inventor of the well-known Rayfield Carburetor for automobiles, and an acknowledged authority on the combustion of liquid fuels.

Built by Engineers—Approved by Men Who Know the Heating Business

Heating plant engineers, manufacturers and oil-burner men quickly approve the Rayfield after inspection and testing.

These men came to see what we have. Some of them were open-minded, some were not. They witnessed demonstrations, inspected burners in operation, talked to users and made tests under their own conditions.

As a result of their observations they report that the Rayfield is:

—a simple and quiet power burner

—correct from an engineering standpoint

—equipped with remarkable safety controls.

You are invited to make a similar investigation of the Rayfield, and you should do it if you are following the trend of the heating trade toward oil burning.

For Steam, Vapor, Hot Water, Hot Air

The Rayfield is fully automatic and operates successfully in any good heating plant. It comes in various sizes and has had three years of practical tests in homes, apartments, theatres and factories.

You have been waiting a long time for this scientific oil burner—a burner that you would readily install in your own home after seeing a demonstration.

Send for illustrated circular.

Rayfield Mfg. Co.

21st and Rockwell Sts. CHICAGO

Listed as Standard by the Underwriters' Laboratories

Contractor-Dealers Wanted

The Rayfield franchise will appeal to men who know the heating business. A profitable connection is offered responsible parties who are prepared to demonstrate, sell and install our equipment. Write for territory and further particulars.

Find out

about this greatest discovery in the history of OIL HEAT:

THE NEW *Silent*

NO COAL **Nokol**

AUTOMATIC OIL HEATING FOR HOMES

It cuts noise (in the past unavoidable with automatic oil heat) *to the vanishing point.*

It actually increases the high efficiency—which for periods up to nine years, in more than 33,000 homes—*has established what we believe to be the lowest-cost records for uninterrupted automatic oil-heating comfort.*

All by perfection of one simple, remaining principle: *the softening of flame, with complete combustion.*

Every man in the home-building, home-equipping field should have full information—for discussion with clients. Sent upon request.

AMERICAN NOKOL COMPANY

215 N. Michigan Avenue, Chicago, Ill.

Makers and guarantors of Nokol, first domestic oil burner listed as standard by Underwriters' Laboratories, and approved by all leading Safety Boards

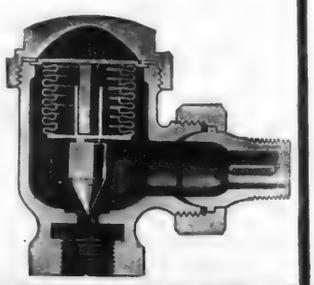
17 College Fraternities Keep Warm With

SARCO Radiator Traps

The Fraternity Clubs Building, New York, is the home of 17 college fraternity clubs, and is the most modern building of its kind. It has 17 stories and contains about 550 rooms.

In designing this handsome structure the architects, Murgatroyd & Ogden, New York, took unusual precautions to see that everything possible was done to insure utmost comfort to the guests—to insure economical operating costs and durable equipment. So Sarco Radiator Traps were used throughout.

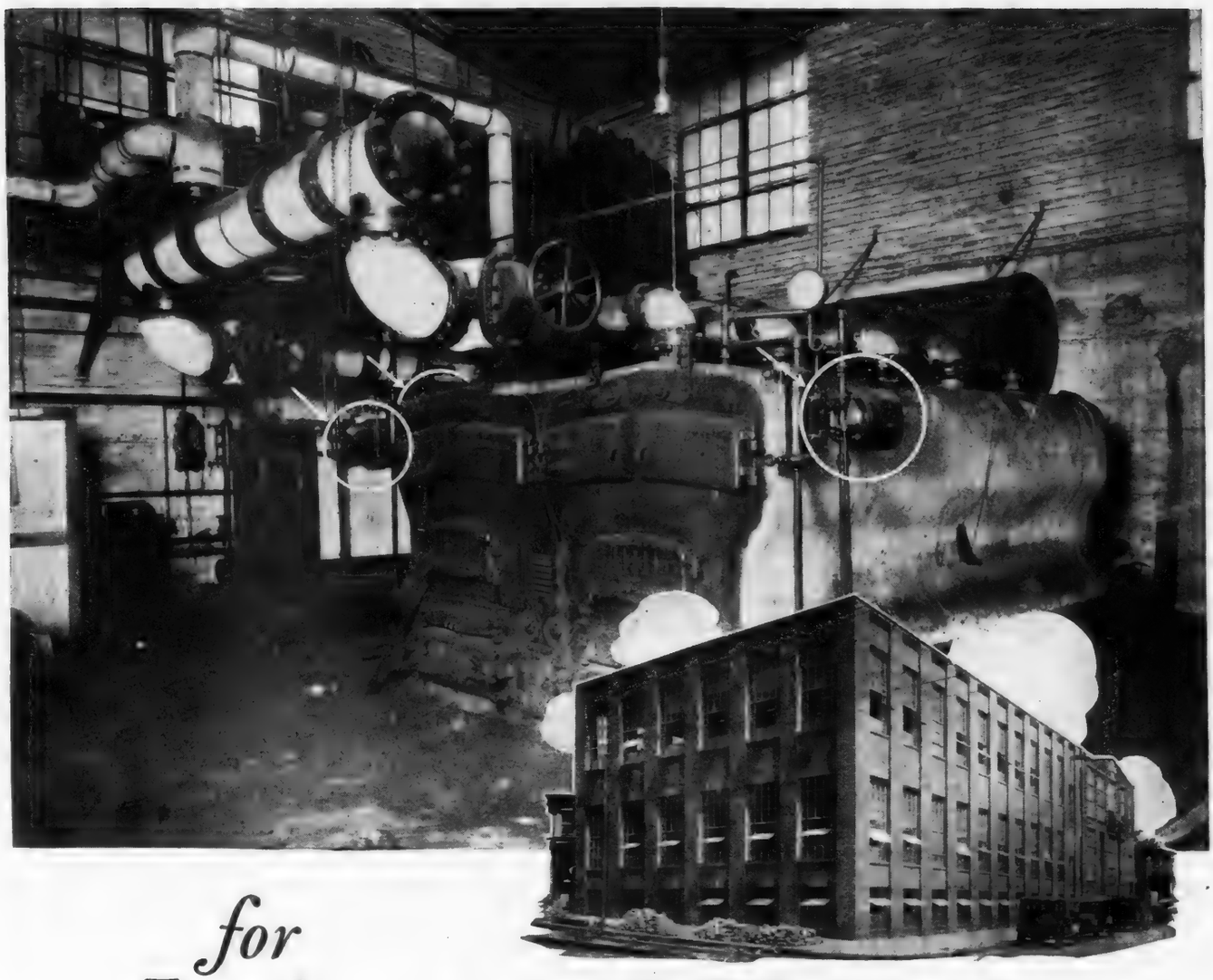
These factory-adjusted traps have unusually large discharge. They are noiseless in operation. Won't freeze or air-bind. Prevent water hammer. Are self-cleaning and easy to take apart.



Write for Booklet P-129

Sarco Co., Inc.
183 Madison Ave.
New York City

Boston Chicago Detroit
Buffalo Cleveland
Philadelphia



for Industrial Heating

use

McDonnell & Miller Duplex Water Feeders

In large heating systems, where returns are long and condensation is often held up in the system, a McDonnell & Miller Duplex Water Feeder is double value.

A hot fire, a slow return—a broken boiler. But it's impossible with a McDonnell & Miller Duplex Water Feeder on the job, for, whatever the conditions in the system, the boiler can never go dry.

The McDonnell & Miller Duplex Water Feeder is the best insurance against burned boilers and cracked sections. It automatically supplies make-up water as is needed and, by means of its overflow valve, disposes of excess condensate that is sometimes returned from the system.

"If you keep the boiler water line where it belongs, there can be no burned boilers or cracked sections."

McDonnell & Miller

BOILER CONTROLS

General Offices • WRIGLEY BUILDING • CHICAGO ~ Warehouse Stock • BUSH TERMINAL • BROOKLYN

BAKER Automatic Oil BURNER —COMPLETE SATISFACTION— BAKER Automatic Oil BURNER

THE success or failure of an oil burner is the efficiency, economy and simplicity by which it attains combustion. The **Baker Burner,** through its patented features of combining preheated air with completely atomized oil, accomplishes this end.

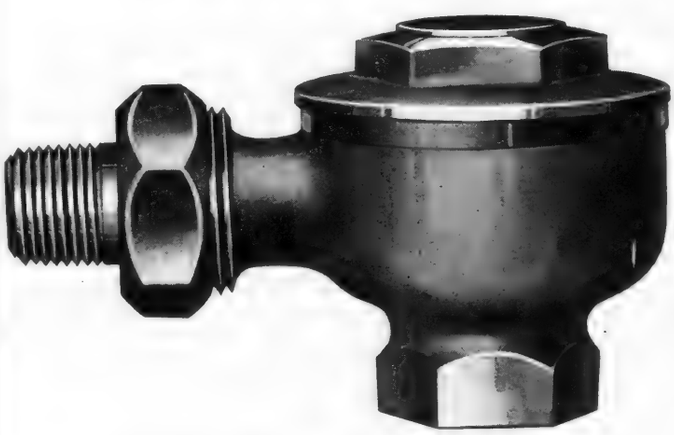
Seven years of unfailing service to the American Public without an unsatisfactory installation is the enviable record held by the **Baker Burner.** Representation in the largest cities from coast to coast, with sales mounting into thousands, show the popular favor it is accorded everywhere. **Baker Heat is Guaranteed Heat.**

Installation season is here. TIE UP WITH SUCCESS! Write or wire for information about our dealer's franchise for your territory. This is your opportunity to become established before the installation season advances. We will be glad to refer you to any of our dealers upon request.

AUTOMATIC HOME HEATING CO.,
Pueblo, Colorado

Dependable Heat All Through The Year

THERMOFLEX No. 1 RADIATOR TRAP



The growing list of large installations and their efficient operation and economy means that when you use and specify Thermoflex you don't go wrong.

Write our nearest distributor for information.

A few more Thermoflex installations:

QUINCY JUNIOR HIGH SCHOOL, Quincy, Mass.

MASS. CITIES REALTY CO., Haverhill, Mass.

BROWN HOTEL, Detroit, Mich.

WENDELL PHILLIPS SCHOOL, Minneapolis, Minn.

EXCHANGE REALTY BLDG., Providence, R. I.

MACNALLY BLDG., Springfield, Mass.

More to come.

W. D. CASHIN COMPANY
35 Hartford St., Boston, Mass.

DISTRIBUTORS:

Heating Specialties Co.	Philadelphia
E. W. Abrahamson	Buffalo
Eugene Smith Co.	Cleveland
Sim D. Rollins Co.	Minneapolis
C. R. Lingo Eng. Sales Co.	Cincinnati
Ryan Sales Co.	Nashville
J. H. Doody	Los Angeles
Washburn Garfield Co.	Worcester, Mass.
Morton Mcl. Dukehart Co.	Baltimore

ENGINEERED TO A STANDARD BUILT COMPLETE AT THE FACTORY

Kleen-Heet

The Pioneer *of* Progress

Of course, minor improvements in oil heating will be developed as the years pass. That is the way of progress—and the price of leadership.

Kleen-Heet will pioneer them. Just as Kleen-Heet has done in the past.

But, fundamentally, the Kleen-Heet of ten years hence will be the Kleen-Heet of today!

Just as the Cadillac or Pierce-Arrow or Rolls-Royce of today is, fundamentally, the same as ten years ago.

For Kleen-Heet is a product of sound engineering practice. Developed by the Winslow Boiler and Engineering Company, its engineering superiority among oil burners is accepted.

Attested by the fact that—again in 1925, as in 1924 and in 1923, more Kleen-Heets were installed in the home of the oil burner industry—Chicago—than burners of any other make.

Some desirable territory is still available for dealers. Write or wire for profit-making proposition.

Winslow Boiler and Engineering Co.
208 South La Salle Street, Chicago

KLEEN-HEET *With* Oil

TESTED AND LISTED AS STANDARD BY THE UNDERWRITERS' LABORATORIES

—now $75 LIST

Former price $85

GUARANTEED 5 YEARS

Monroe Oil Pump Type TJ

It was well known before the Oil Pump, Type TJ, was introduced in April that the demand for this pump was sure to be tremendous at the list price of $85. But the demand vastly exceeded optimistic calculations before the season began! When the season opened, the best price we felt this season's volume would warrant was $85.00, but the big demand now permits us to cut the list price $10—making the present list price of the Monroe Oil pump, Type TJ—$75.

MONROE Oil Pump

TYPE TJ

Quantity re-orders are coming by mail and telegraph. Buyers have investigated and ordered quantities. They realize what this pump means to them—it assures dependability, silent and smooth running performance.

Remember the "Monroe" is made by a firm that *has been making pumps for sixteen years.*

ORDER TODAY! Specify "MONROE" on Every Contract.

MONROE MACHINE TOOL COMPANY

NEW YORK SINGER BUILDING BROADWAY

737 W. Jackson Blvd. — CHICAGO

16 YEARS EXPERIENCE MANUFACTURING PUMPS

PHILADELPHIA 437 REAL ESTATE TRUST BUILDING

9 reasons why you should sell the Efficient Heating Boiler—

WATER TUBES made of seamless steel tubing. The metal is only ⅛ inch thick. The most rapid transfer of heat from the hot gases around the tubes to the water within the tubes is thus accomplished. A striking contrast to the thick cast iron sections found in most boilers.

THE TUBES ARE NUMEROUS as well as small which brings a large heating surface in contrast with a small volume of water. Quick steaming—less time and the result is less fuel used.

THE TUBES ARE SLOPED at an angle of 10 degrees, giving positive and rapid circulation of the water from the back to the front of the boiler and preventing the tubes from becoming steam bound.

TWO BAFFLES causing the hot gases to pass three times over the tubes, instead of only once. This removes the largest amount of heat from the gases before entering the chimney. The temperature of the gases entering the chimney is seldom more than 235°, which is only about 20° above the temperature of the steam in the boiler.

STEEL HEADERS, into which the tubes are expanded by rolling out their ends, have removable cover plates which makes cleaning of the inside of the tubes easy and positive.

STEAM DRUM, made of steel boiler plate with welded joints, gives ample storage space for steam and water.

BRICK SETTING, or specially designed sheet iron setting which minimizes the loss of heat thru its walls. The sheet iron setting is built in sections that are easily bolted together, can be set up in a very short time. Each section is made up of layers of sheet iron with a half inch space between them. This space is filled with a half inch layer of asbestos to prevent heat from escaping.

THREE CLEANING DOORS in the side of the setting. The outside of the tubes can be reached thru these doors. Any soot that may collect on the tubes can be removed with a long handled wire brush.

THE BOILER IS SMALL and light in weight in spite of its large heating capacity. Any "Efficient Heating Boiler" can be carried thru the ordinary two-foot-six doorway.

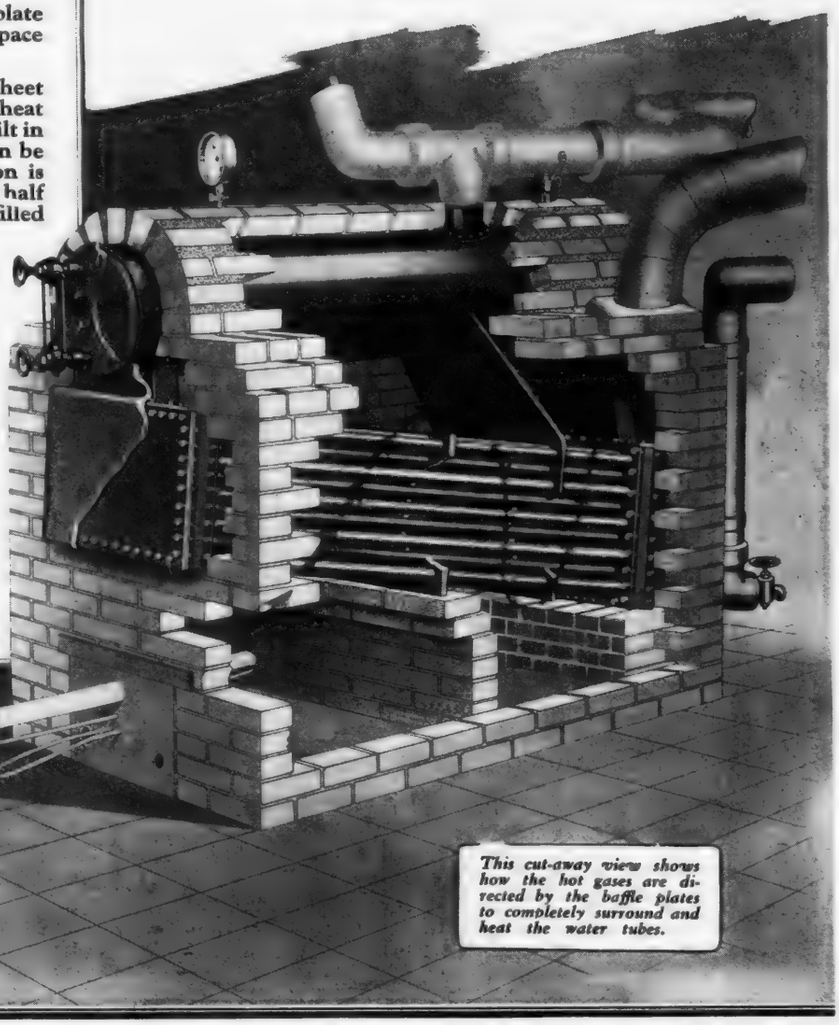
Efficient Heating Boiler Company
4116 So. Halsted St., Chicago, U.S.A.

NOW

EFFICIENT HEATING BOILER

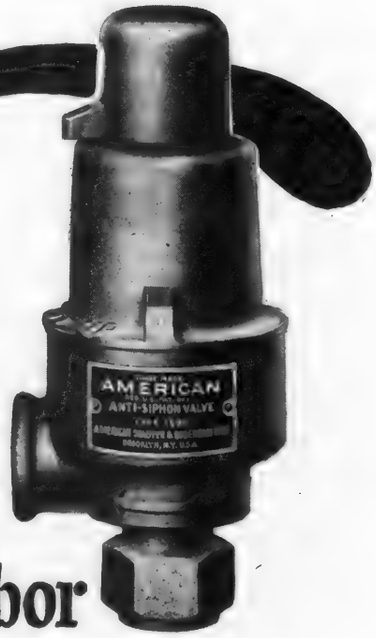
—a water tube boiler——

for oil heating in homes, small apartments, hospitals, clubs, hotels, factories, etc. — —



This cut-away view shows how the hot gases are directed by the baffle plates to completely surround and heat the water tubes.

Now



Big Saver of Money, Time and Labor

No longer is it necessary to go to the expense and delay of digging a hole 10 ft. deep, or more, in order to bury the oil storage tank below the oil burner. Now oil cannot siphon from the tank in the event of a break in the pipe line to burner even if the tank is buried only a few inches—provided you install

AMERICAN

Anti-Siphon Valve for Oil Burners

This valve permits of direct pipe connection between burner and main storage tank, with the tank at any desired level *above* the burner.

In addition to a substantial saving in installation cost, the American Anti-Siphon Valve provides a constant pressure head on the oil pump.

Write for Anti-Siphon Valve Catalog No. 14-1590 or simply *mail the coupon.*

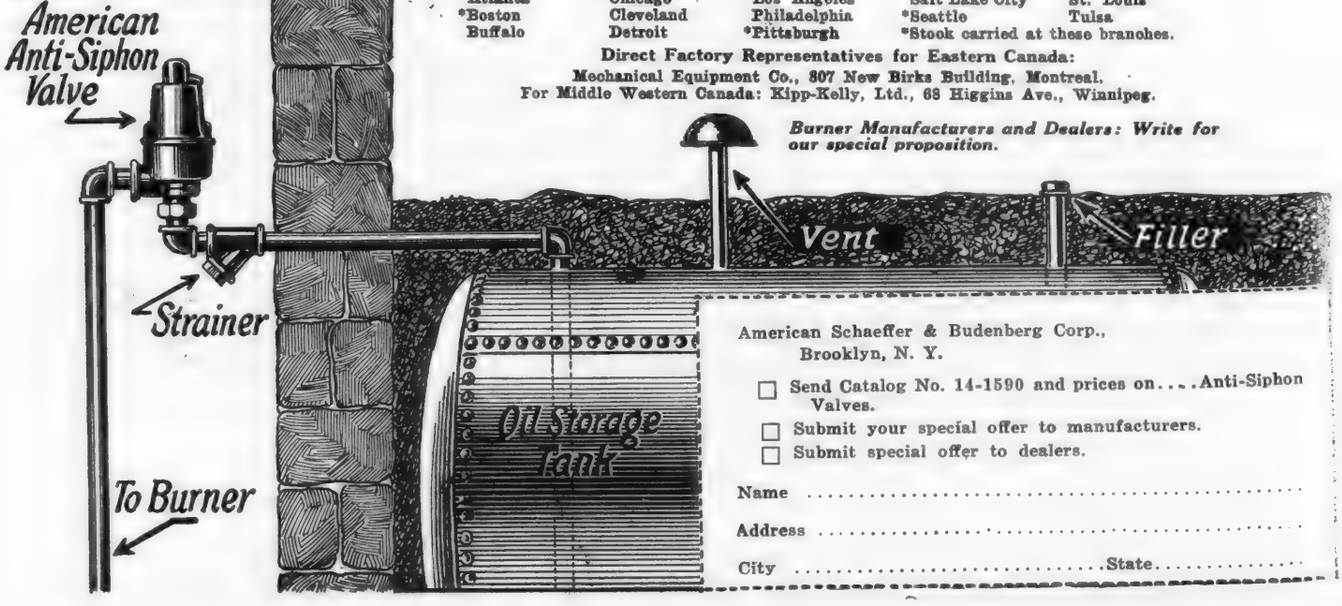
AMERICAN SCHAEFFER & BUDENBERG CORP.

Brooklyn, N. Y.

Atlanta	*Chicago	*Los Angeles	Salt Lake City	St. Louis
*Boston	Cleveland	Philadelphia	*Seattle	Tulsa
Buffalo	Detroit	*Pittsburgh	*Stock carried at these branches.	

Direct Factory Representatives for Eastern Canada:
Mechanical Equipment Co., 807 New Birks Building, Montreal.
For Middle Western Canada: Kipp-Kelly, Ltd., 68 Higgins Ave., Winnipeg.

Burner Manufacturers and Dealers: Write for our special proposition.



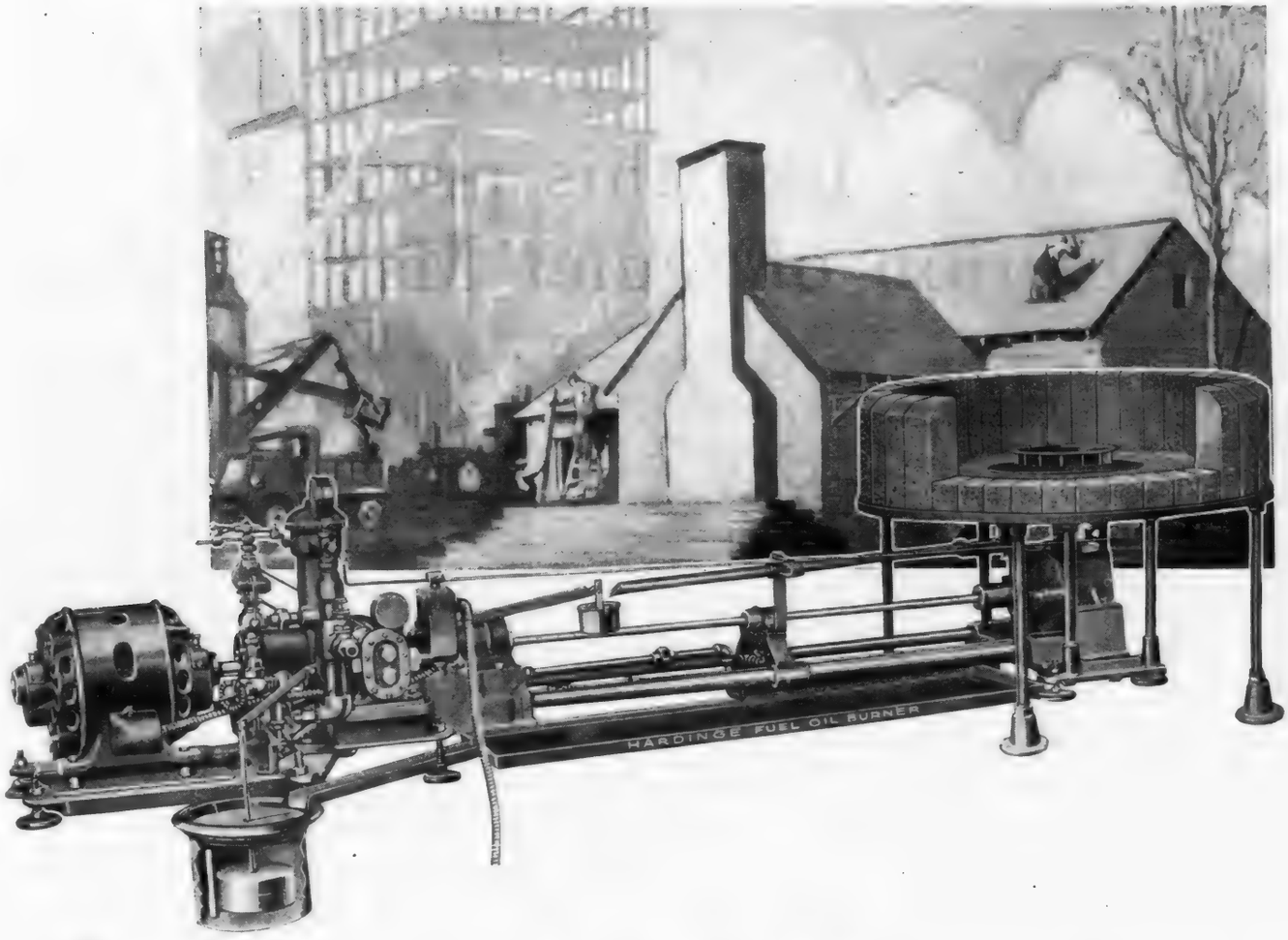
American Schaeffer & Budenberg Corp.,
Brooklyn, N. Y.

☐ Send Catalog No. 14-1590 and prices on....Anti-Siphon Valves.
☐ Submit your special offer to manufacturers.
☐ Submit special offer to dealers.

Name .....

Address .....

City .....State.....



from Bungalow *to* Skyscraper

Hardinge Fuel Oil Burners are used successfully on all types of buildings —from the small bungalow to the mammoth skyscraper. That's one of the reasons why Hardinge dealers are kept busy the year 'round.

There are several reasons why conscientious dealers insist on the Hardinge.

The Hardinge is guaranteed for ten years. Both domestic and industrial burners are listed as standard by the Underwriters' Laboratories and the Board of Standards and Appeals of New York. The Hardinge is economical, practically noiseless and dependable. It is manufactured by a concern whose name and products are known throughout the world.

This is especially important to dealers. Nowhere in the Hardinge contract will you find definite specifications relative to the number of burners to be purchased with the signing of the contract. Dealers are not required to order any definite number of burners, as the burners will be shipped only as required. We invite those who can qualify to join the ever-increasing list of Hardinge dealers.

HARDINGE BROTHERS, INC., 4149 Ravenswood Ave., Chicago

HARDINGE
FUEL OIL BURNER

Letters like this prove the satisfaction of Quiet May dealers

The letter reprinted below is typical of many others which we are constantly receiving, and which testify to the high character of our co-operation with dealers.

Bridgeport Burnoil Sales Company
Distributors of the
BURNOIL AUTOMATIC HOME HEATING SYSTEM

Bridgeport, Conn.
June 19, 1926.

May Oil Burner Corporation,
Winchester St., near Carey,
Baltimore, Md.

Gentlemen;

I want to take advantage of a dull moment to tell you what I think of the Quiet May Oil Burner and the people behind it.

The Quiet May Oil Burner is everything an oil burner should be, quiet, efficient and troubleproof. Its lack of complicated mechanism means little or no service for the dealer, once adjusted it stays adjusted. The fact that but two models are made which will handle the smallest and largest heating jobs is something every dealer is interested in when taking on an oil burner.

Mays 50-50 advertising plan is one which has proven to us just how much the May Corporation is behind its dealers as well as their product. Not only is the May Corporation behind us with their advertising but also with sales helps and sales promotion plans.

The Easy Payment Plan and the May Dealers Floor Plan is another of the fine features coupled up in the May Franchise.

On my visit to the May Oil Burner Corporation at their Second Annual Dealers Convention I was impressed with the organization behind the burner we are selling.

May Burners are going stronger and stronger, once a May Dealer always a May Dealer.

Sincerely,

BRIDGEPORT BURNOIL SALES COMPANY.

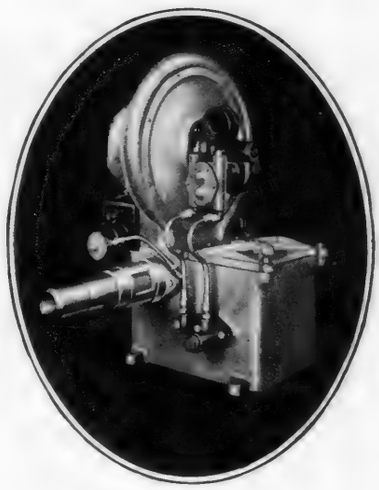
Let us give you complete information about the Quiet May, and about our dealer finance and consumer deferred-payment plans! Dealers with years of oil burner experience are turning to the Quiet May because of its noiselessness and efficiency—and because of the splendid co-operation of its makers in both advertising and selling. Write today to The May Oil Burner Corporation, *Factory and Main Offices,* Baltimore, Maryland. *Branch Offices,* 331 Madison Ave., New York; 1020 Commonwealth Ave., Boston; 2401 Chestnut Street, Philadelphia; 507 Security Bldg., St. Louis. Terminal Sales Building, Seattle, Washington.

Quiet May

QUIET MAY AUTOMATIC

AUTOMATIC OIL BURNER

Here is . . . an unusual opportunity!



Qualified, high-grade dealers are now being selected to sell this remarkable domestic oil burner. Those who are chosen are assured a handsome profit

HERE is an opportunity to secure an exclusive franchise for an oil burner that is as nearly perfect as human ingenuity can make it. The man in your community who secures the franchise for this burner is certain to make a worth-while, consistent profit. It's too good a proposition for you to overlook.

The Petro domestic oil burner is not a new, unproved machine. It is an established success. It has been endorsed and recommended by prominent heating engineers everywhere. Hundreds of Petro burners are now in use in homes around New York City.

Production has now reached the point where the Petro may be sold in large quantities. Dealers are wanted in all parts of the country.

Your application will be carefully considered. But if you are unable to meet our exact requirements, you are wasting your time and our own by applying. First-class business reputation, financial soundness, high personal standing in your community—these three are essential. Oil burner experience will also be a factor in selecting men. But it is not absolutely necessary.

The dealers who are finally selected have an unusual opportunity to make a splendid income. They will be given the closest cooperation. They will be assured prompt deliveries. They will be backed by convincing advertising. And they will have the satisfaction of knowing that their oil burner is the mechanical superior of any burner on the market.

If you feel yourself qualified to meet our requirements, clip the coupon below, fill it out and mail it today. You will receive an application blank and further information about our proposition.

The Company behind the Petro

The Petroleum Heat and Power Company, manufacturers of the Petro, have been in the oil burner business for over twenty years. This concern has ample financial backing. It is headed by men who know oil burners and the oil burner market.

During the twenty years that the Petroleum Heat and Power Company have been in the oil burner business, they have installed thousands of burners in industrial plants, schools, hotels and office buildings. Among these installations are—Harvard University, the Ritz-Carlton and the Providence-Biltmore Hotel, the Metropolitan Life Insurance Building, and the Equitable Building in New York.

The Petroleum Heat and Power Company manufacture a complete line of Petro Burners, from that suitable for the smallest furnace to one adapted to a 500 h. p. boiler.

Nine reasons why Petro is safe, silent and reliable

1. Compact unit—everything mounted on a single base.
2. No parts inside the fire box of the boiler or furnace subject to the heat of combustion.
3. Vacuum oil pump an integral part of the burner.
4. Air register for admitting proper amount of air to suit size of boiler and draft conditions.
5. Alemite lubrication for the four moving parts, sufficient for a year's operation.
6. Patented anti-siphon valve, preventing any possibility of oil leaks.
7. Patented combustion control which makes its performance absolutely safe.
8. Fifteen-day clock thermostat which automatically regulates the temperature during the night as well as the day and economizes on fuel.
9. Patented Masterstat mounted on the boiler which will shut off the burner automatically if there is no water in the boiler.

PETRO

RESIDENCE OIL BURNER

A product of

PETROLEUM HEAT AND POWER COMPANY

Main Office: 511 Fifth Avenue, New York

Petroleum Heat and Power Company
511 Fifth Avenue
New York City

Gentlemen:

I am interested in becoming a dealer for the Petro Residence Oil Burner. Please send me an application blank and further information.

Name.....

Street.....

City.....State.....

80.7% efficiency!

There are "spendthrift" oil burners just as there are spendthrift people. An oil burner that blows heat up the chimney is in the same class as the reckless youth who squanders his dad's hard-earned dollars. Both should be shunned.

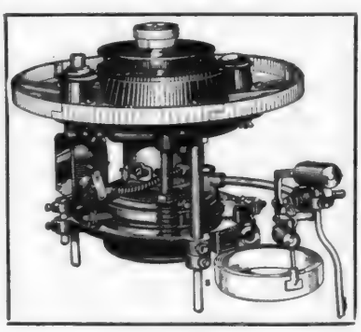
ABC is the Ben Franklin of oil burners. It has no fan or blower to waste heat. That's why it was given the highest heating efficiency rating in the United States Government oil burner test.

Sell the Oil Burner that Squeezes Heat Dollars.

Twelve reasons why an ABC agency makes money

1. **QUIET.** ABC is really quiet. Allowances are not made after installation.
2. **NO CARBON OR SOOT.** Engineers know what an immense advantage this is.
3. **LESS OIL REQUIRED.** Unique means of atomization assures complete combustion. Every particle of oil is burned. The heat rises slowly and is completely absorbed by the boiler.
4. **LONGER BOILER LIFE.** Circular flame, evenly applied all around the boiler, greatly increases its life.
5. **BURNS LOW-PRICED OILS.** ABC burns 28-30 and 32-36 gravity oil.

Passed by New York Board of Standards and Appeals.



6. **ODORLESS.** An ABC heated home is odorless.
7. **NO UNSIGHTLY PARTS OUTSIDE OF BOILER.** This ABC feature has made sales.
8. **SIMPLE.** Only one moving part subject to wear.
9. **NO FAN OR BLOWER.** Heat is not blown up the chimney and wasted. No noisy fan introduces ABC to your guests.
10. **CLEAN.** It's useless to say how clean ABC is. You must see to appreciate.
11. **AUTOMATIC** Heat when you want it—as you want it.
12. **OIL BURNED IN SUSPENSION.**

Approved by Underwriters' Laboratories.

AUTOMATIC BURNER CORPORATION

312 N. May Street, Chicago

ABC OIL BURNER

no noise ~ no carbon

Safety—Comfort—Satisfaction

with **Aetna** TRADE-MARK

AUTOMATIC OIL BURNERS

The AETNA Automatic Oil Burner is reliable and economical in operation; it is SAFE—safe to sell and safe to use. A master feed-valve *automatically* controls the size of the flame; a patented trip-bucket *automatically* shuts off the oil supply if the pilot light is not burning; a thermostat *automatically* regulates heating service; a diaphragm or Sylphon Regulator automatically controls the steam pressure or hot water temperature and a special oiling system *automatically* lubricates the gears.

Listed by Underwriters Laboratories, approved by New York Board of Standards and Appeals and all Insurance and Municipal Authorities wherever installed.

Adapted for Steam, Hot Water and particularly for Warm Air Furnaces.

Aetna Dealers Sales with unlimited range of field allowed by nine Aetna sizes, realize real profits.

Nine sizes of burners, consume ½ to 40 gallons per hour and take care of 500 to 20,000 ft. of radiation.

Local distribution since 1916. Now ready for national distribution. Lowest priced high grade burner on the market.

Operates on all grades of fuel oil, 24°-45° A.P.I.

The AETNA is built for lifetime service, is mechanically perfect and operates without attention or adjustment.

Write For Dealers' Plan

AETNA AUTOMATIC
OIL BURNER, INC.
Georgia Ave., Providence, R. I.

Gentlemen:

Please send me full particulars regarding the AETNA Dealers' Plan.

Name.....

Street.....

City.....State.....

H & V

AETNA AUTOMATIC OIL BURNER, INC.

Georgia Ave. Providence, R. I.

CROSLEY

AUTOMATIC OIL BURNER

$330.

F.O.B. Cincinnati. Complete with room thermostat, pump and electric ignition. Can be installed profitably with tank for less than $450.

Powel Crosley, Jr., has applied his highly successful production methods which have earned him leadership in the radio field to the manufacture of an oil burner of unique design and remarkable performance.

J. H. Stewart, E.E., long known in the oil-burner industry, has developed features of full automatic control that have simplified both the action and the installation of this burner.

The burner is in two parts,—both factory assembled and tested. The burner is placed directly in front of the furnace before the ash-pit door, and the second unit, the self-priming centrifugal pump, is placed on the wall. The burner has but two moving parts,—the motor shafts.

The ignition is by a 110 volt electric arc.

The self-priming centrifugal pump is an original feature and is part of the assembly. Gravity oil feed from pump to burner.

Electric double-seat solenoid valve controls oil flow.

Atomization is by centrifugal spray and low-pressure air. The burner is non-carbonizing.

Radio clarifier built into the burner.

Only one model to stock. It has a capacity of ¾ to 5 gallons per hour, or 250 to 2500 sq. ft. of steam radiation to 3500 sq. ft. of hot-water radiation.

Burns any oil not lower than 28 degrees A.P.I. which will pass the zero cold test and is free from sediment.

Controls are recycling; no unguarded interval.

Ash pit is lined with brick when installed.

High voltage room thermostat furnished as standard equipment. Low voltage controls interchangeable at additional price. Boiler control extra.

Motor is 1/6th H.P., 3450 RPM repulsion-induction, brush-lifting totally enclosed. Air cooled by air for combustion.

Safety control in time-limit switch which shuts down burner after definite interval of attempted ignition. Small quantity of oil (3 pints) is maximum quantity that can be spilled by leak or break.

No mechanical vibration transmitted to furnace due to especially designed mounting.

All parts compactly and neatly housed in steel stampings of black enamel. Entire burner outside of furnace.

Dealers now being appointed!

Crosley Oil Burner dealers will enjoy the impetus given Crosley Oil Burners through a million happy owners of Crosley radio sets. The policies that have formed the successful marketing of radio will mark the selling of Crosley Oil Burners.

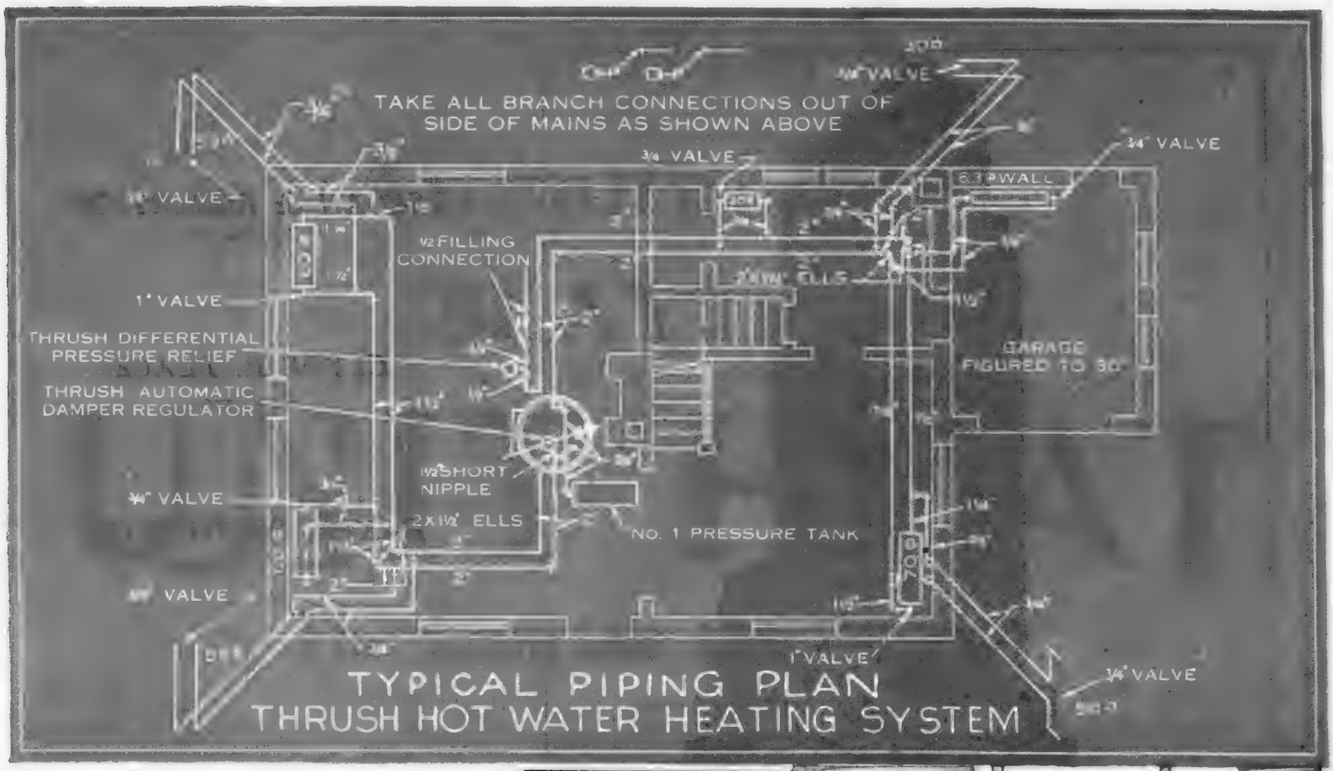
Applications for dealerships are being passed upon as received. Inquiries will bring full details of the burner, discounts and qualifications necessary for authorized dealer appointment. Give all details of experience and resources possible in your first letter.

OIL BURNER DIVISION

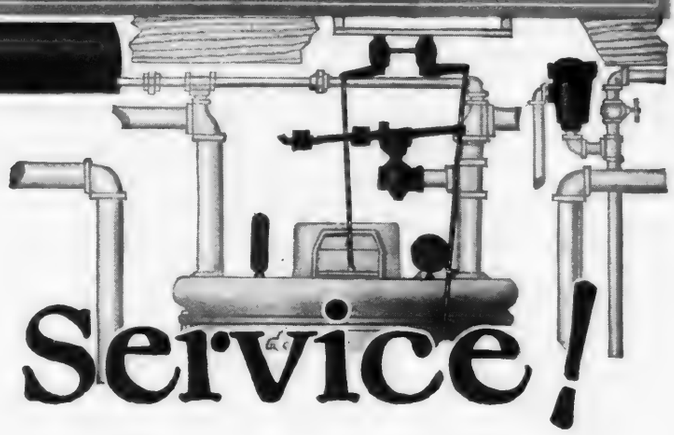
THE CROSLEY RADIO CORPORATION

Powel Crosley, Jr., Pres.

CINCINNATI, OHIO



Free Plan Service!



THRUSH engineers are at your service all the time. When you want piping plans---just ask us. Don't wait until you have the job ---let us help you get it! When competition is close a Thrush piping plan will help you figure costs so you'll get the job and make money too! Try this service now.

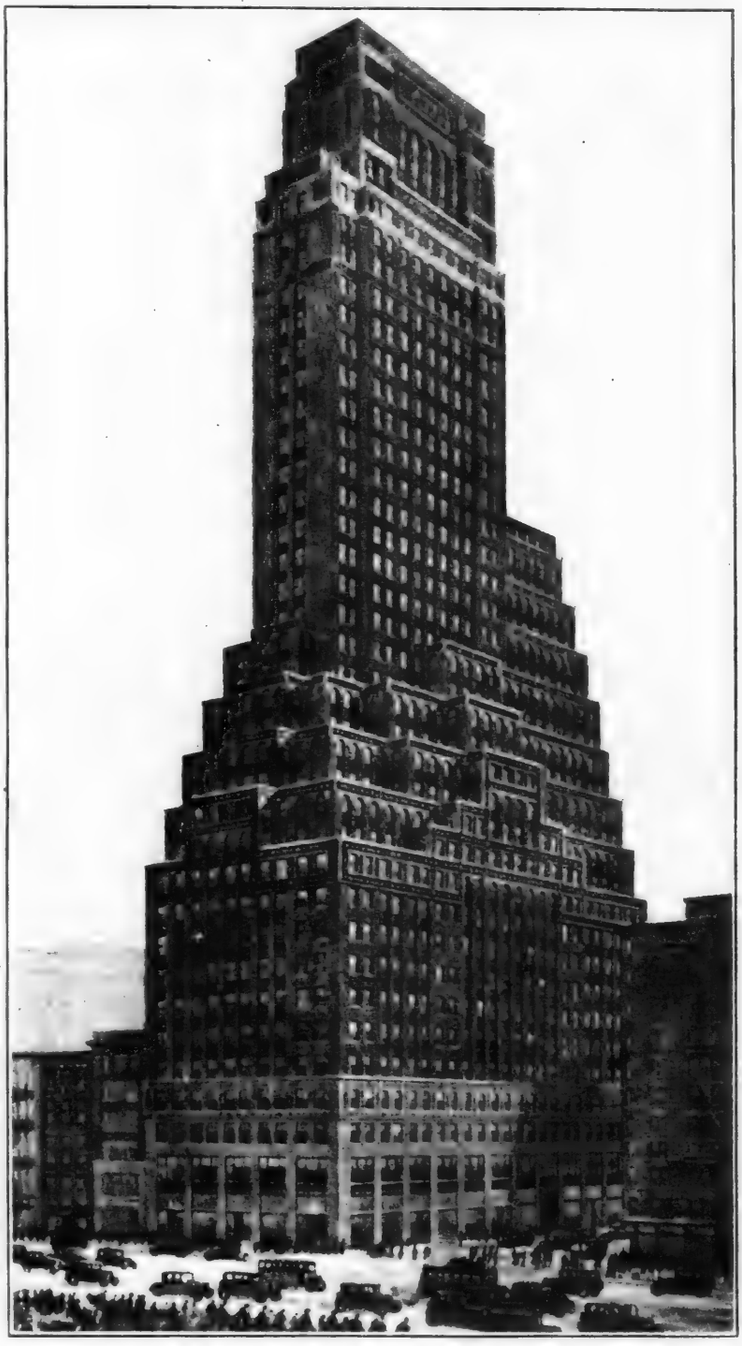
Write for catalogue!

Dependable!

Wherever you meet a heating contractor who has been using Thrush regulation for his Hot Water Heating jobs you hear that word---*dependable.* Satisfaction to your customer--that's sure with Thrush equipment on the job! Installation is easy--just six feet of pipe and eight fittings Doesn't cost much either. Try it on your next hot water job.

THRUSH SYSTEM
OF HOT WATER HEATING

H. A. THRUSH & CO., *Peru, Indiana*



The Fred F. French Companies Building
547-51 Fifth Avenue, New York City

SLOAN & ROBERTSON
Architects

CLYDE R. PLACE
Engineer

BAKER, SMITH & CO.
Heating Contractor

Marsh Packless Fig. 133

This is simply another one of the many largest and finest buildings in New York City equipped with Marsh Valves.

MARSH VALVE COMPANY

DUNKIRK ***Exclusive Sale Distributors*** **NEW YORK**

Edward T. Hetherington
1718 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs,
431 So. Dearborn St., Chicago, Ill.

United States Radiator Corp'n
General Offices: Detroit, Mich.

All territory east of west lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

Jas. P. Marsh & Company
118 So. Clinton St., Chicago, Ill.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County, "Chicago, Illinois."

Taylor-Forbes Company, Guelph, Ont., Canadian Agents

Announcing

SLAYTER

UNIT HEAT

The Complete Oil Furnace

HERE, at last, is a complete oil heating plant—Slayter Unit Heat—designed to operate with far greater efficiency than any oil burning attachment—tested, proved and perfected over a period of more than four years—and priced within the reach of the average home owner. It's the greatest advance ever made in oil heating. You'll hear more about it soon.

GAMES SLAYTER

LAFAYETTE, INDIANA

RANGE *of* SIZES

Increases Nu-way's Sales Possibilities

Nu-way Burners are made in four sizes—a greater range than has any other burner of its type. This range enables you to sell the owner of a five-room bungalow without asking him to pay for more capacity than he needs. It enables you to sell the owner of a fifty-flat building without overtaxing the burner.

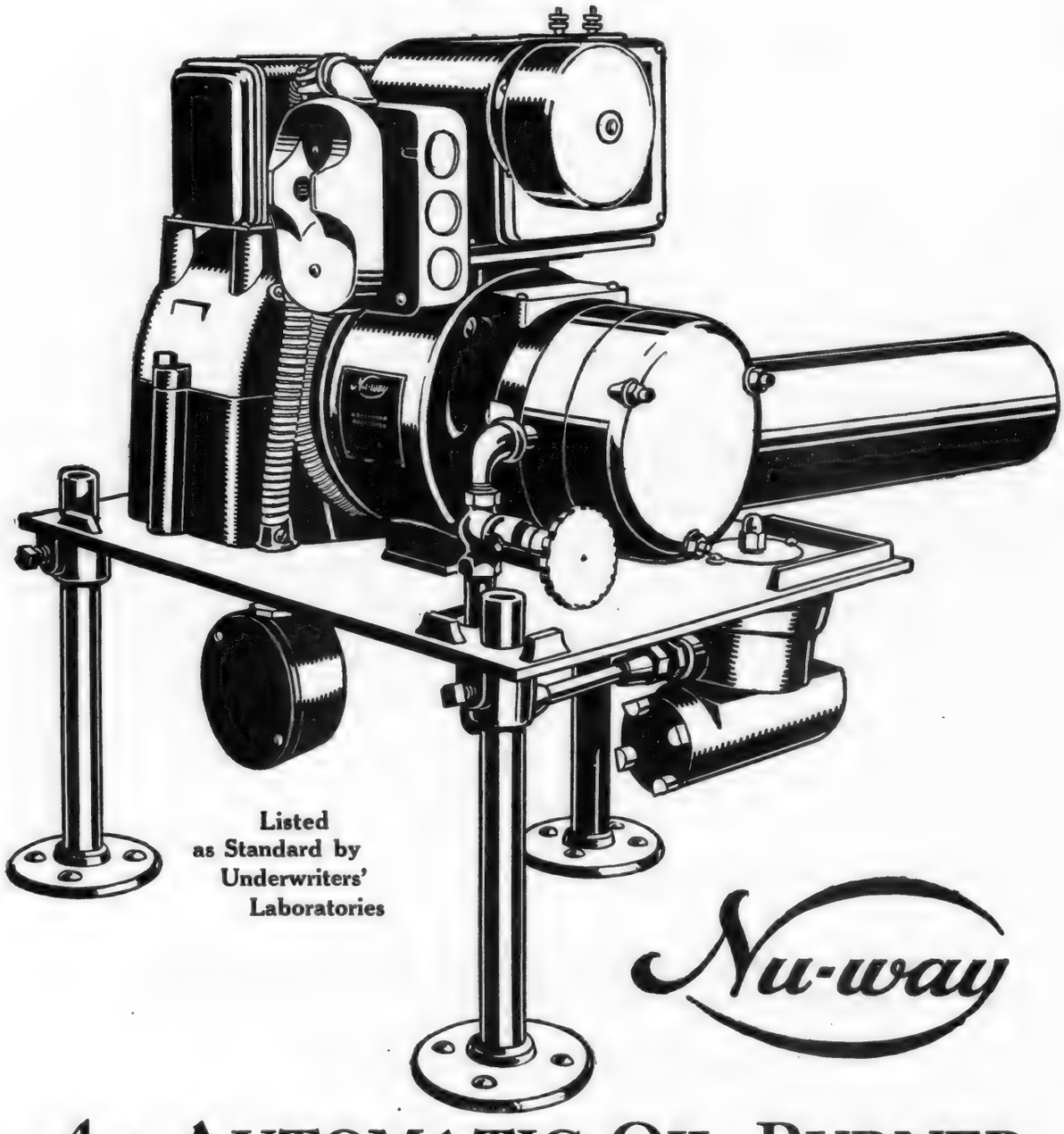
Simplicity and Other Sales Features

To range of sizes add the advantages of simplicity, of lack of vibration, with attendant long life. Nu-way is listed as standard to burn 28 gravity fuel oil up to 48 gravity distillate. It has a timed ignition system that prevents delayed ignition and backfire. Its special parts are made by world-famous firms. Has special protective devices that work automatically.

Write for Plan

The Nu-way and our selling plan is appealing to reliable dealers everywhere. Write for our prices, literature and ideal financing plan. Is your territory open? Write and see. It will pay you.

THE NU-WAY CORPORATION
ROCK ISLAND, ILLINOIS.



Listed as Standard by Underwriters' Laboratories

Nu-way

An AUTOMATIC OIL BURNER

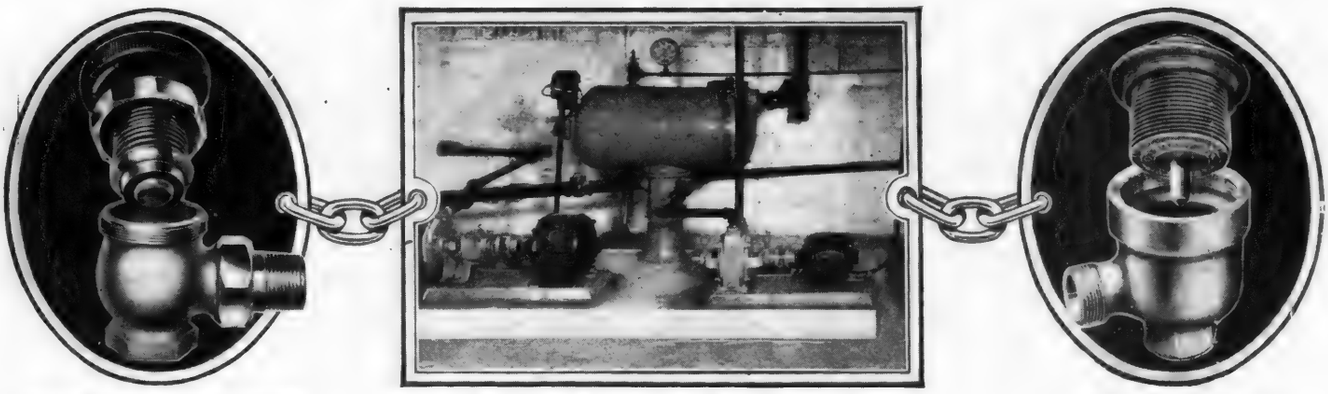
WHEN thousands of the nation's foremost engineers OK Illinois Products . . . and when they reorder, again and again, after thorough and rigorous tests . . . there MUST be sound reasons for their choice. We solicit *your* inquiries also, on the basis of DEFINITE, GUARANTEED RESULTS

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD, PRES. INCORPORATED 1900

BRANCHES AND REPRESENTATIVES IN 40 CITIES

CHICAGO



Trane Bellows—Packless Valve *Two Motor Trane Return Line Special Vacuum Pump* *Trane Bellows Trap*

Trane Undivided Responsibility Heating in Hotel Dixie Grande, Bradentown, Fla.

Two hundred Trane Bellows Traps and Valves are in service here, along with the Two-Motor Trane Return Line Vacuum Pump illustrated above.

The use of Trane Traps, Valves, and Pumps together gives the Hotel Dixie Grande an Undivided Responsibility Heating System. This means that they have a guarantee not only for the satisfactory operation of the individual items but also for their successful performance *together*.

The Trane Company is the only manufacturer of highest grade pumps who also makes heating specialties, and conversely, the only manufacturer of heating specialties who also makes high grade pumps. This fortunate combination gives the specifiers, installers, and users of heating equipment an opportunity to secure a complete heating system that is fully guaranteed as a unit. Undivided Responsibility.

The Handsome, Centrally Located Hotel Dixie Grande, Bradentown, Florida, Heated by Trane.

Architect: Mr. Frank A. Winn, Jr.
Engineers: Merkel Engineering Co.
Heating Contractor: Mr. S. H. Klemestrud

This advertisement is No. 6 of the Trane Undivided Responsibility series.

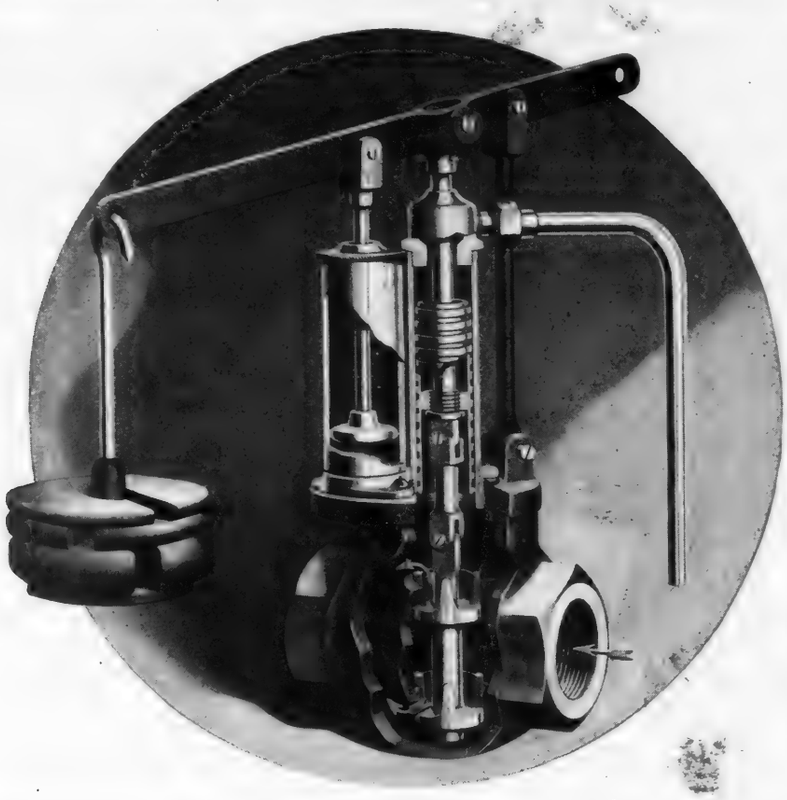
Everyone who is interested in modern heating should have Trane literature. Bulletin 14 describes the complete line of heating specialties, including Trane's 14-corrugation seamless, jointless bellows radiator traps, and the everlasting Trane Bellows Packless Supply Valves.

Bulletin 20 describes the complete line of pumps — condensation, vacuum, circulating, booster — including the efficient and moderately priced Two-Motor Return Line Special outfit used in the Hotel Dixie Grande.

Trane's new product —Heat Cabinets that take the place of radiators — are completely described in the Trane Heat Cabinet Catalog.

All this material, plus additional information on Undivided Responsibility Heating, will gladly be sent upon request. Ask for the Trane Bulletin Binder

The Trane Company, 200 Cameron Ave., La Crosse, Wis., manufacturers of vapor and vacuum heating specialties and pumps. Branches and sales connections at New York, Chicago, Boston, Cincinnati, Newark, Philadelphia, Buffalo, Cleveland, Detroit, Seattle, LosAngeles, Albany, Minneapolis, Salt Lake City, Greensboro, N. C., Zanesville, Ohio, Tampa, Fla., Baltimore, Md., Des Moines, Ia., New Haven, Conn., Sheboygan, Wis., Kansas City, Mo. In England: 22-23 Clerkenwell Close, London, E. C. 1. In Canada: The Trane Co., 21-23 River St., Toronto, 2; Thomas Robertson & Co., 134 Craig St., West, Montreal; F. S. Murdoch, 310 Breadalbane, Winnipeg; A. B. Madden. 48 Sparks St. Ottawa. In China: C. J. Doughty & Co., 7 Jinkee Road, Shanghai.



The Klipfel No. 1 Pressure Regulator —Piston Type—is made for all pressures in sizes 3/8 to 14 inch, inclusive. Sold by leading Jobbers — everywhere.

Six Reasons Why Engineers Prefer Klipfel Pressure Regulators

THESE are the six most important features mentioned by hundreds of satisfied Engineers, as their reasons for preferring the Klipfel No. 1 Pressure Regulator:

1. Simple, rugged, direct-acting; includes no troublesome springs, packing boxes or pilot valves.
2. Automatically reduces any initial steam, air or water pressure to any desired point above two pounds.
3. Maintains reduced pressure constantly regardless of fluctuations in the boiler pressure or changes in the demand for steam.
4. Bronze inner valve (plunger type) does not require regrinding—it is specially designed to withstand the effect of wire drawing.
5. Oil dashpot insures constant service—prevents inner valve from vibrating or chattering.
6. Capacity is equal to—or greater than that of any competing valve —fully guaranteed.

The 80-page Catalog contains valuable engineering data, good descriptions and illustrations covering a complete line of Steam Specialties. Write for your copy—today.

KLIPFEL MANUFACTURING CO.
2657 W. Harrison St. Chicago, Illinois

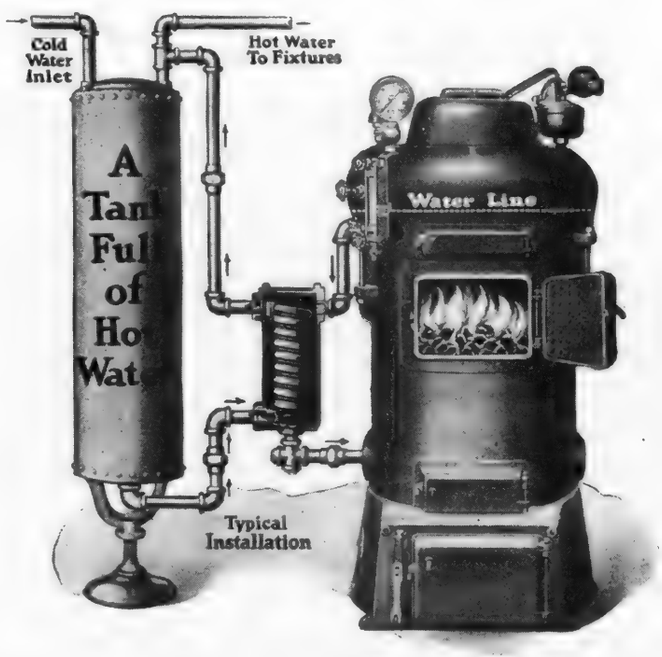
KLIPFEL PRESSURE REGULATING VALVES

EXCELSO
Triple Coil
Indirect Heater

Top View, capacities 600 and 800 gals.

Specify Excelso Big Heaters for Large Buildings

Apartment houses, office buildings, clubs—wherever large quantities of Hot Water are used—connect Excelso Indirect Water Heater to steam or vapor boiler, and Hot Water will be supplied to any number of users at practically no cost.



An Excelso Quality Indirect Heater for any size building, ready to supply Hot Water for One Family or One Hundred Families.

Write for details also about Oil Pre-Heating.

EXCELSO SPECIALTY WORKS, INC.
59 CLYDE AVE., BUFFALO, N. Y.

NATIONALLY DISTRIBUTED BY LEADING WHOLESALERS AND BOILER AND RADIATOR MANUFACTURERS

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters

McALEAR heating and power specialties used throughout

The Jewelers Building, Chicago, shown here, is the tallest building in the United States west of New York. Its dome is the tallest in the world, and the construction of the building is up to the minute in every respect. A unique feature is the provision for parking space for automobiles on each floor from the first to the twenty-third story, a total capacity of 570 cars.

McAlear Heating and Power Specialties are used throughout this modern building. Is there much need for further recommendation of McAlear Quality?

DEPENDABLE SPECIALTIES — McALEAR — QUALITY AND SERVICE

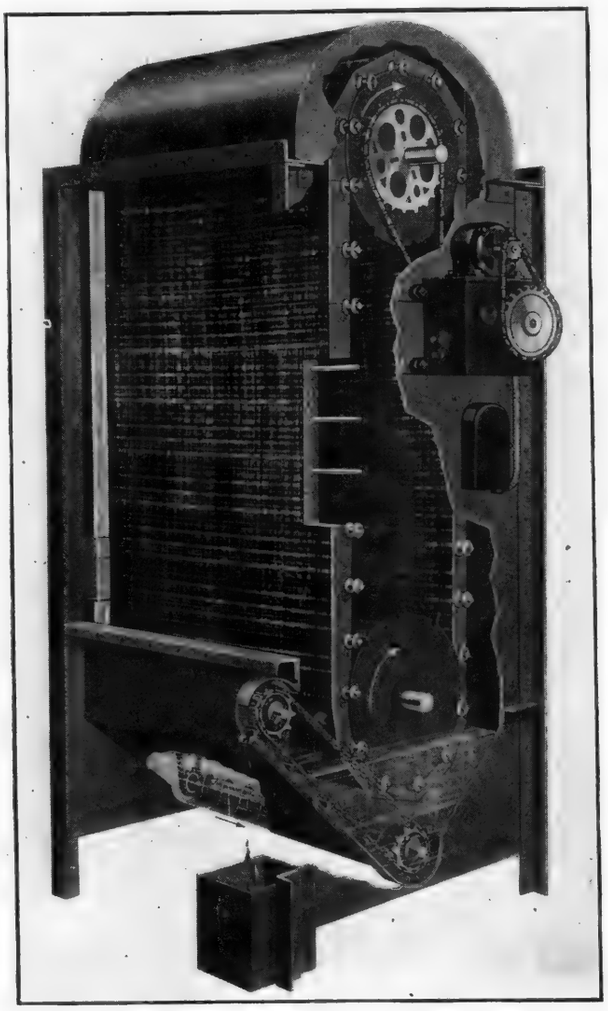
FREDERICK P. DINKLEBERG, *Architect.*

C. W. RUTH ENGINEERING CO., *Engineers.*

ENSIGN ENGINEERING CO., *Heating and Ventilating.*

THE McALEAR MFG. CO.
Chicago, Ill.

The Last Word COMPLETELY



Phoenix Constant Effect Air Filter

As shown, the air flows through two passes of a rotable screen, composed of many die-stamped plates, carried on through rods. The shape of these plates is such that thousands of small tortuous air passages are formed, in which the air is constantly whirled and deflected against the viscous film with which the plates are coated as the screen is moved through the Coatol (viscous fluid) reservoir in the base of the filter.

The Sediment Ejector in the base of the filter is chain-driven from the upper sprocket shaft. The spiral conveyor moves the sediment along the bottom trough of the fluid reservoir into the lower recess of the small chain-flight conveyor, which slowly lifts the sediment above the fluid level and ejects it into a convenient receptacle. The movement is slow enough to prevent ejection of the fluid. The filter is thus entirely automatic, requiring no attention whatever throughout the life of the filter.

The Phoenix Constant Effect Air Filter is operated entirely automatically by a ¼ H.P motor for all sizes Its operation is controlled by an electric switch clock, thereby assuring definite movement of the filtering screen at predetermined intervals —it is self-cleaning—constant effectiveness and resistance is assured, and the sediment gathered by the filtering screen is automatically ejected from the sediment settling chamber—no renewal of oil is necessary IT ELIMINATES THE OPERATOR

NOTE

It will be noticed that the Phoenix Constant Effect and National Rotary Air Filters employ the already proven method of the viscous film principle—namely, the dividing of air volume into small innumerable subcurrents and passing these through tortuous passages.

Human Hands Never

in Air Filters

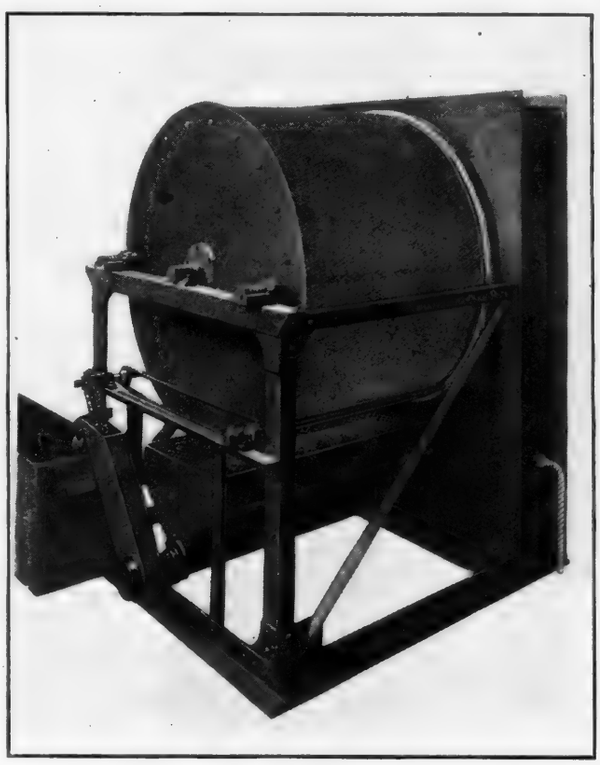
AUTOMATIC

National Rotary Air Filter

The filtering surfaces are composed of successive layers of woven copper fabric, wound upon a cylindrical metal form, as shown. The meshes of the copper fabric form innumerable tiny passages for the air (tortuous passages) which is drawn into the cylinder from all directions. These passages are intercepted at every conceivable angularity by the narrow surfaces of the thin copper ribbons of which the fabric is knitted, thus forming a most effective filtering medium.

The cylinder is rotated very slowly, by means of the small motor driving through a gear reducer, and the automatically operated Rotol (viscous fluid) distributor, gives positive self cleaning at all times.

The National Rotary Air Filter is equipped with an Automatic Sediment Ejector, chain-driven from one cylinder drive shaft. Thus the National Rotary is entirely automatic and independent of the "Human Element."



The National Rotary Air Filter is completely automatic; operated by a ¼ H.P. motor for all sizes. Its movement is continuous, approximately one revolution in 12 to 16 hours—it is self-cleaning through the use of a special oil distributor, thereby assuring a constant cleaning—constant effectiveness and resistance. The sediment is automatically ejected from the sediment chamber—no renewal of oil is necessary. IT ELIMINATES THE OPERATOR.

Drying Systems, Inc.

Drying and Air Conditioning Equipment—Automatic Air Filters—Industrial Furnaces—Heat Treating—Allosteel Direct Air Heaters
Industrial & Domestic Oil Burners

Offices, Shops and Laboratories
1800 Foster Avenue
Chicago

50 Church St
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2011 Park Ave.
Detroit

Offices in Principal Cities
(Consult Telephone Directory)

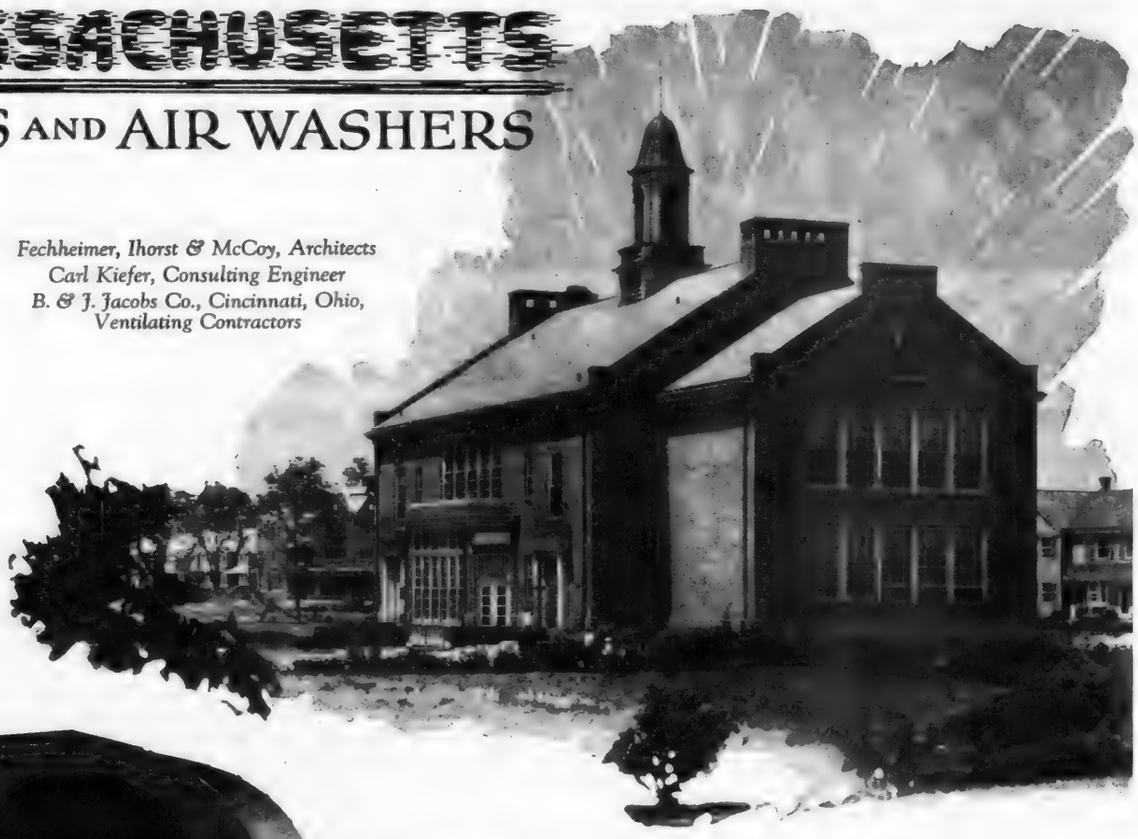
"The Problem First — The Filter To Suit"

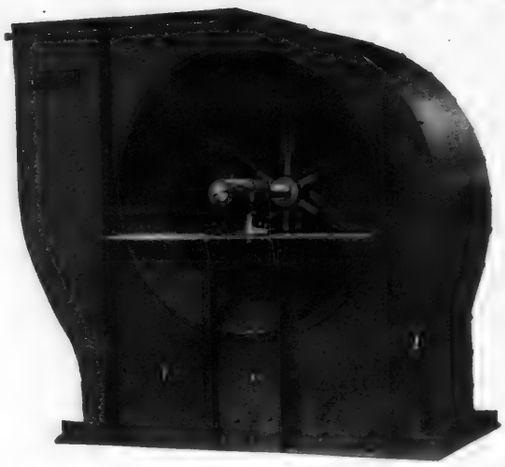
Air Filtration Engineering—the problem first, then investigation, research, layout, engineering and installation—is the Drying Systems, Inc., policy of air filtration engineering.

Touch These Filters

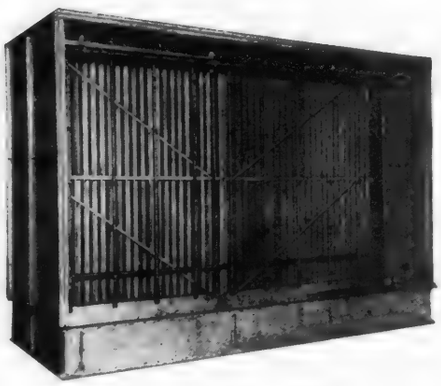
MASSACHUSETTS
FANS AND AIR WASHERS

Fechheimer, Ihorst & McCoy, Architects
Carl Kiefer, Consulting Engineer
B. & J. Jacobs Co., Cincinnati, Ohio,
Ventilating Contractors





Single Width Modified Squirrel Cage Fan



Massachusetts Air Washer

The Sterling Reputation

of Massachusetts Fans and Air Washers was taken into consideration when equipping the Dale Park Public School at Mariemont. (A model town, suburb of Cincinnati.)

The superiority of our apparatus has been conclusively shown time and again by their adoption in many of the largest buildings in the United States.

In the Massachusetts Fan the combination of Multiblades and the six larger blades give the combined characteristics of a Steel Plate and Multiblade Fan, enabling the Architect and Engineer to select a fan of maximum efficiency.

Massachusetts Air Washers are built in a wide range of sizes, suitable for purifying, cooling, humidifying and de-humidifying air for all purposes. They are simple in design, and easy to install and operate. The self-cleaning nozzles are non-clogable and eliminate the necessity of flushing mechanism.

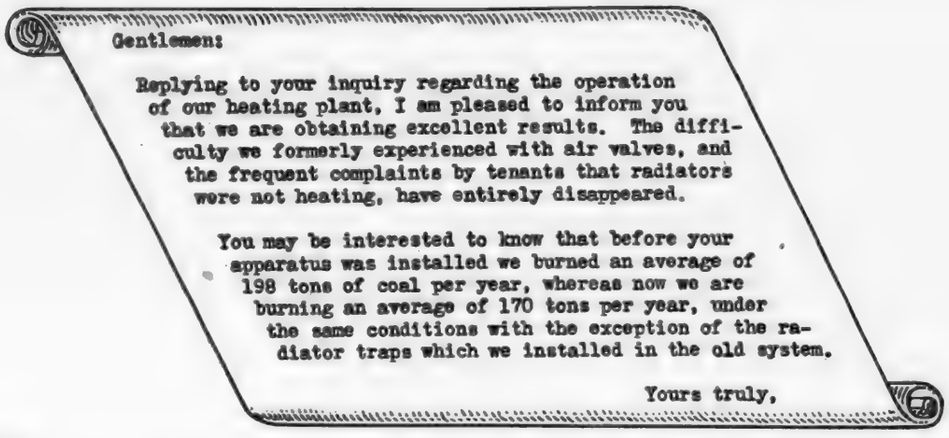
MASSACHUSETTS BLOWER DIVISION
of
THE BISHOP & BABCOCK SALES CO.
General Offices - 4901-4915 Hamilton Ave. N.E.
CLEVELAND, OHIO.

BISHOP & BABCOCK
VENTILATING EQUIPMENT

Barnes & Jones Radiator Traps

SAVE 14%

The Heating Systems that Insure Fuel Conservation


Gentlemen:

Replying to your inquiry regarding the operation of our heating plant, I am pleased to inform you that we are obtaining excellent results. The difficulty we formerly experienced with air valves, and the frequent complaints by tenants that radiators were not heating, have entirely disappeared.

You may be interested to know that before your apparatus was installed we burned an average of 198 tons of coal per year, whereas now we are burning an average of 170 tons per year, under the same conditions with the exception of the radiator traps which we installed in the old system.

Yours truly,

Original letter on file at our office

BARNES & JONES Radiator Traps have been directly responsible for many material savings in fuel. Many voluntary statements by satisfied architects, engineers and owners have stressed the favorable difference in fuel consumption where our equipment is used.

Savings as great as 30 per cent have been proven possible with this type of system.

Barnes & Jones Equipment is being installed in more and more new construction because the architect, engineer or owner knows that absolute satisfaction can be the only result to follow the proper installation of Barnes & Jones equipment.

VAPOR and VACUUM HEATING SYSTEMS of PROVEN QUALITY

Barnes & Jones

Representatives in Principal Cities

5 Melrose Street, Boston ***300 Madison Ave., New York City***

A typical installation of Visible Heat Cabinets. These cabinets are available in a wide range of sizes and styles.

Trane Heat Cabinets

Trane Heat Cabinets take the place of radiators. They were invented by Reuben N. Trane and developed and perfected in the Trane Engineering Laboratories to meet the demand for an improved method of distributing heat.

The Heat Cabinet is a new application of convection heating. In effect, the heat is bottled up in the Cabinet and is released only in sufficient quantities to care for the demand. The Cabinet gives heat instantly when desired, or by merely adjusting a damper it can be turned off so that no heat units escape to the room.

As shown by the illustration above, a Heat Cabinet looks somewhat like a radiator enclosure. The principle of operation and the features of the Heat Cabinet, however, are vastly different than those of enclosed radiators.

Heat Cabinet deliveries start in September. Orders received now will be acknowledged with approximate shipping date. Prompt delivery is assured on orders that come in early.

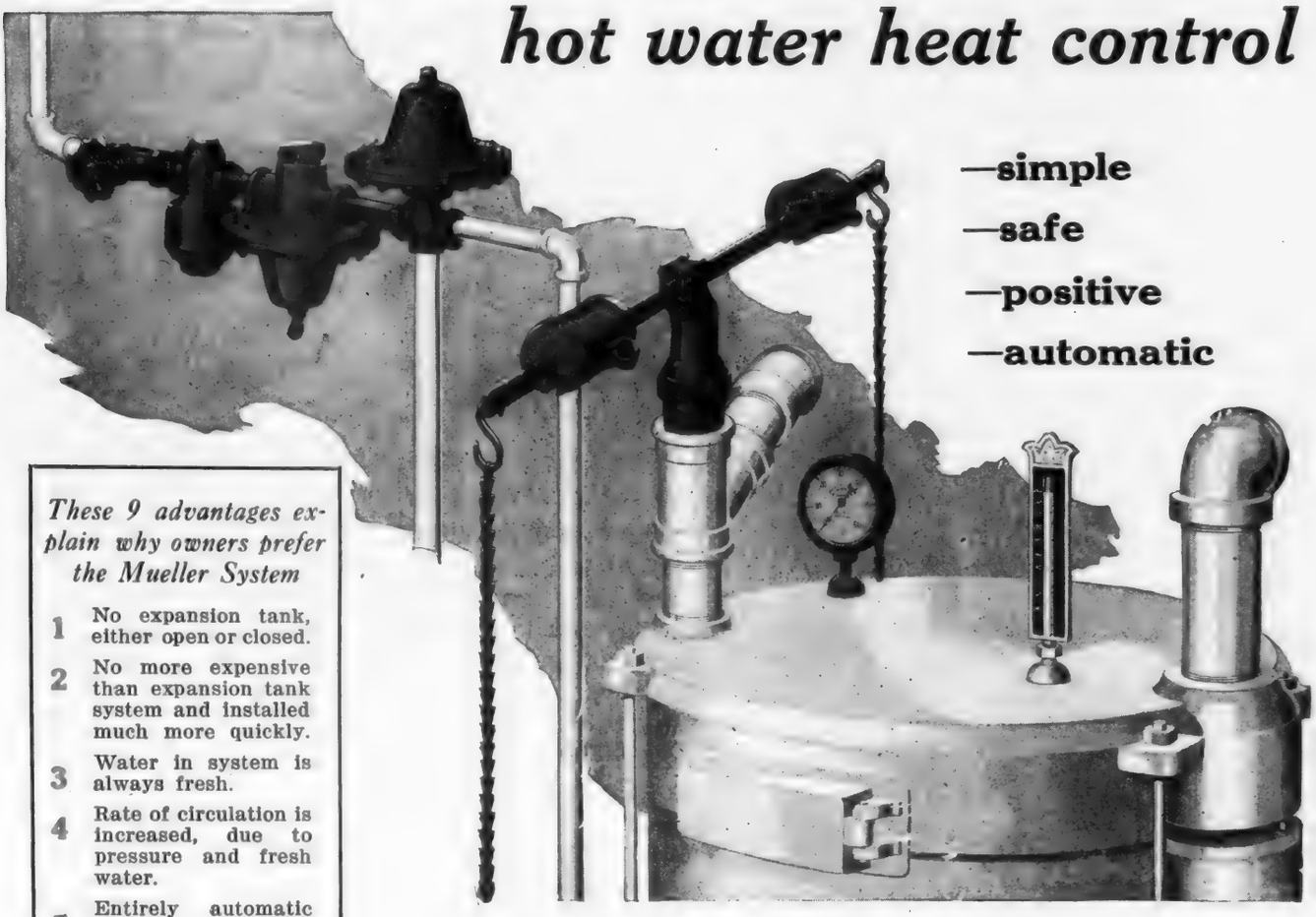
All heating systems that use Heat Cabinets are known as Cabinet Heating Systems. Cabinet Heating can be used in connection with regular steam, vapor, vacuum, or hot water heating equipment. No special design is necessary. No special heating system is necessary. The Cabinets are easily installed on any job where radiators could be used, or where radiators are used at present.

Their many good points are discussed at length in the pages of the Trane Heat Cabinet Catalog—their pleasing appearance, their light weight, their moderate cost, and above all, the perfect heat control that is made possible by the Heat Cabinet principle.

If you haven't received your copy of this catalog, write for it.

The Trane Company, 206 Cameron Ave., La Crosse, Wis., manufacturers of vapor and vacuum heating specialties and pumps. Branches and sales connections at New York, Chicago, Boston, Cincinnati, Newark, Philadelphia, Buffalo, Cleveland, Detroit, Seattle, Los Angeles, Albany, Minneapolis, Salt Lake City, Greensboro, N. C., Zanesville, Ohio, Tampa, Fla., Baltimore, Md., Des Moines, Ia., New Haven, Conn., Sheboygan, Wis., Kansas City, Mo. In England: 22-23 Clerkenwell Close, London, E. C. 1. In Canada: The Trane Co., 21-23 River St., Toronto, 2; Thomas Robertson & Co., 134 Craig St., West, Montreal; F. S. Murdoch, 310 Breadalbane, Winnipeg; A. B. Madden, 48 Sparks St., Ottawa. In China: C. J. Doughty & Co., 7 Jinkee Road, Shanghai.

This is the way owners like *hot water heat control*



—simple
—safe
—positive
—automatic

These 9 advantages explain why owners prefer the Mueller System

1. No expansion tank, either open or closed.
2. No more expensive than expansion tank system and installed much more quickly.
3. Water in system is always fresh.
4. Rate of circulation is increased, due to pressure and fresh water.
5. Entirely automatic as to supply, relief and damper regulation. Requires only minimum attention.
6. A very considerable saving in fuel through automatic damper control and more rapid circulation.
7. Perfectly safe. Reducing valve and relief valve are operated by pressure of water in the system.
8. Reducing and relief valve are positive in action and are the safest type known.
9. Boiling point of water is raised, allowing more efficient heating throughout system.

Did you ever see a hot water heating system owner who liked an expansion tank? Did you ever see an owner who did not frown when you toted a bulky expansion tank up to his attic or installed it in his favorite closet, or spoiled his beautiful bathroom by putting it there?

Not a single hot water plant owner but has wondered why you couldn't give him a better system than the unsightly, unreliable expansion tank. Yet, right in the Mueller Automatic Heat Control System you have just what every owner wants! An absolutely dependable, positive-acting, compact system, that gives more rapid circulation, better heating and important savings in fuel. The Mueller System is automatic throughout—automatic supply; automatic relief; automatic damper regulation. This is the type of control system that is being installed in greater numbers every day.

You save on labor costs when you install the Mueller System. It costs your customer no more—but gives him a much more satisfactory job. Write us for full details.

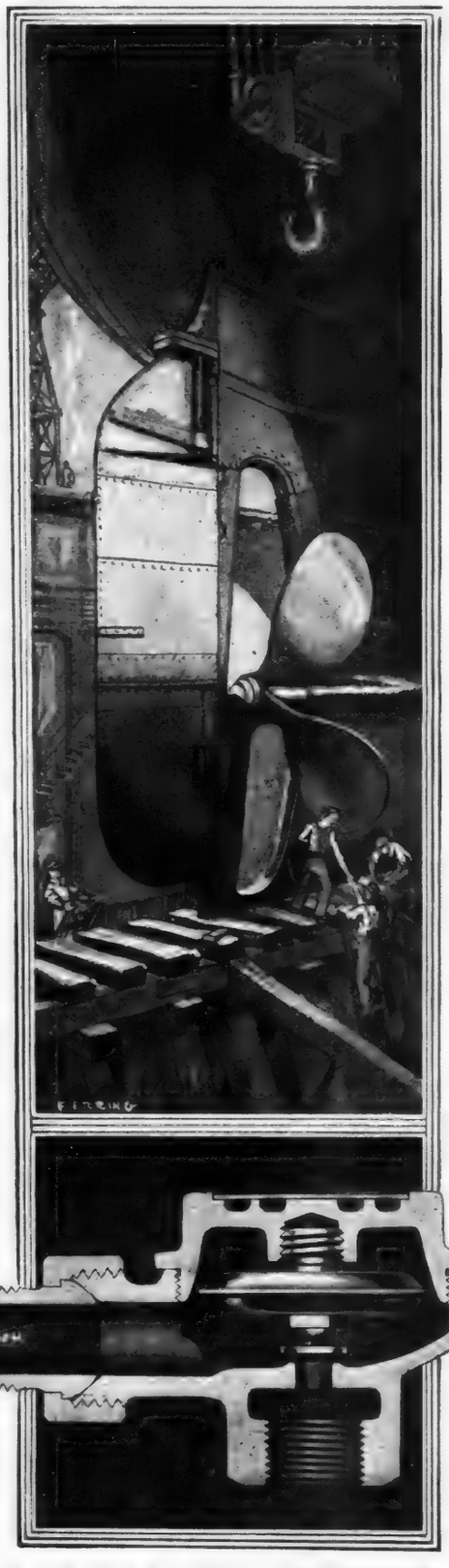
MUELLER CO.
(Established 1857)
Factories: Decatur, Illinois; Port Huron, Michigan.

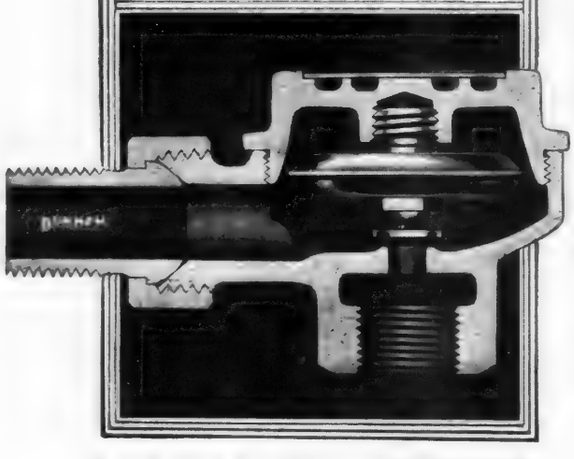
Canadian Factory
MUELLER, Limited, Sarnia

Branches
New York, San Francisco, Los Angeles

MUELLER

Automatic Heat Control System





Look for the Name DUNHAM

Unseen *yet* Vital

The phosphor bronze propeller of the ocean liner is an unseen, hidden thing unless the vessel is in dry dock. And yet what a vital part it plays in the operation of the ship! It works constantly and efficiently without thought or attention. Its design is the result of long study on the part of engineers. Because made from phosphor bronze, it is the most resistant to corrosion of any metal which could be utilized for the purpose.

LIKE THE STEAMSHIP'S PROPELLER the operating disc in the Dunham Thermostatic Radiator Trap does its work unseen and unsung, and entirely without care or thought from those in charge of the heating plant. Yet it plays a vital part in delivering that even, comfortable heat that has made the Dunham System famous.

This important Dunham element is made of phosphor bronze because it is the only metal that will stand up under the conditions of long time service that must be met. In freeing the radiators from water and air and in keeping them filled with steam, the Dunham Thermostatic Disc is constantly expanding or contracting. Phosphor bronze, because of its toughness, its tensile strength and its resistance to corrosion, is able to withstand the stress and strain of this action. It also has a relatively high heat co-efficient which makes it quickly responsive to the temperatures encountered within the radiator.

The disc has walls of ample, uniform thickness with parts receiving the greatest strain specially reinforced. Its action is positive and powerful. Its floating valve seats squarely and tightly to prevent loss of steam. Its life is unbelievably long.

The perfection of the Dunham Thermostatic Disc is the result of three things: 1. Correctness of design. 2. Excellence of materials. 3. Careful, painstaking workmanship. These have made it possible for the operating member to perform its vital though unseen service so that owners receive fullest satisfaction.

Over sixty branch and local sales offices in the United States and Canada bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city.

C. A. DUNHAM CO.

DUNHAM BUILDING

450 East Ohio Street ~ ~ ~ Chicago

VOX POPULI

THE voice of the people is to be reckoned with as a factor in the success of any public building. They consciously or subconsciously feel the tone, atmosphere, style—the undefinable part of your building.

This tone, this atmosphere, this intangible something is derived from no one feature; ventilation is a part, lighting a part, heating a part and many others, but these three are vital—be sure they are right.

Westinghouse experience in the design, manufacture and application of electrical equipment for heating and ventilating systems has been progressive for more than thirty years. Engineering counsel is available to you without obligation.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in all Principal Cities of
the United States and Foreign Countries

In the new Keith-Albee Theatre, Youngstown, Ohio, Westinghouse electrical equipment is used to operate the heating and ventilating equipment and the motion picture steriopticans.

Westinghouse

X88R28

Backed by 25 years of Manufacturing Experience

MILVACO

THERMOSTATIC TRAP

Conceived, designed and built to a purpose — the elimination of trap troubles — the ***Milvaco Thermostatic Trap*** embodies in its detail of construction, principal of operation, and accomplishment of purpose, a standard synonymous to the Milwaukee Valve Company.

Backed by twenty-five years of manufacturing experience —A message with a meaning to the discriminating buyer.

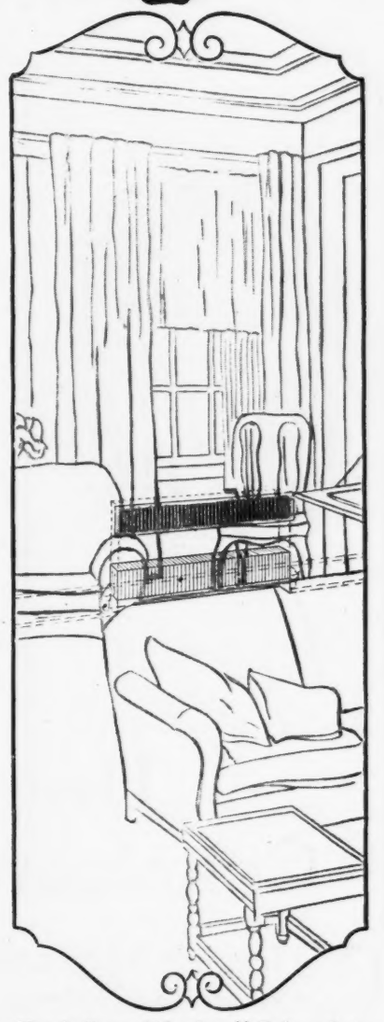
Bulletin No. 23 descriptive in detail of the Milvaco Thermostatic Trap will gladly be mailed you upon request.

MILWAUKEE VALVE CO.

MILWAUKEE, WISCONSIN, U. S. A.

Wall it in . . . and forget it!

Applied to Room Designed by WATSON & BOALER, *Chicago*



How the Herman Nelson Invisible Radiator fits in the wall is shown by this phantom view. Send for the book below.

Herman Nelson Corporation, Moline, Illinois
Please send me the facts about the Herman Nelson Invisible Radiator.

Name.....

Address.....

HERMAN NELSON *Invisible* **RADIATOR**
TRADE MARK

With the Wedge Core
INDESTRUCTIBLE

THE day when you must put up with unsightly space-wasting cast-iron radiators in order to enjoy the definite advantages of radiator heat is past.

No longer need the home owner, the architect, the interior decorator, resort to ornamental boxes, radiator covers or screens, which use extra space, involve inconveniences of control, result in more or less unsanitary conditions, and reduce the heating capacity of the radiator.

So small it can be set in any 4″ wall, the Herman Nelson Invisible Radiator renders all such makeshifts obsolete.

It occupies no wall nor floor space—thus allowing unrestricted opportunity for any desired arrangement of furniture—and full scope for any decorative scheme.

It is indestructible; it can't leak (no soldered joints), nor rust, and even freezing will not harm it.

Write for complete information.

THE HERMAN NELSON CORPORATION, *Moline, Ill.*
Also builders of Univent Ventilation

Sales and Service

BELFAST, ME.	NEW YORK CITY	PITTSBURGH	COLUMBUS	DES MOINES	SAN FRANCISCO	DENVER	SEATTLE
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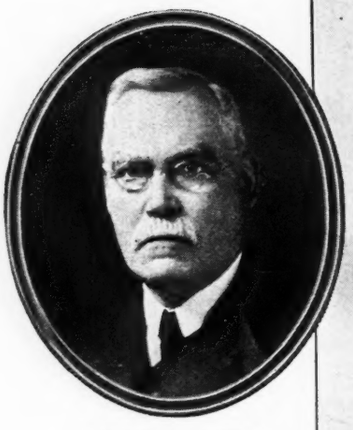
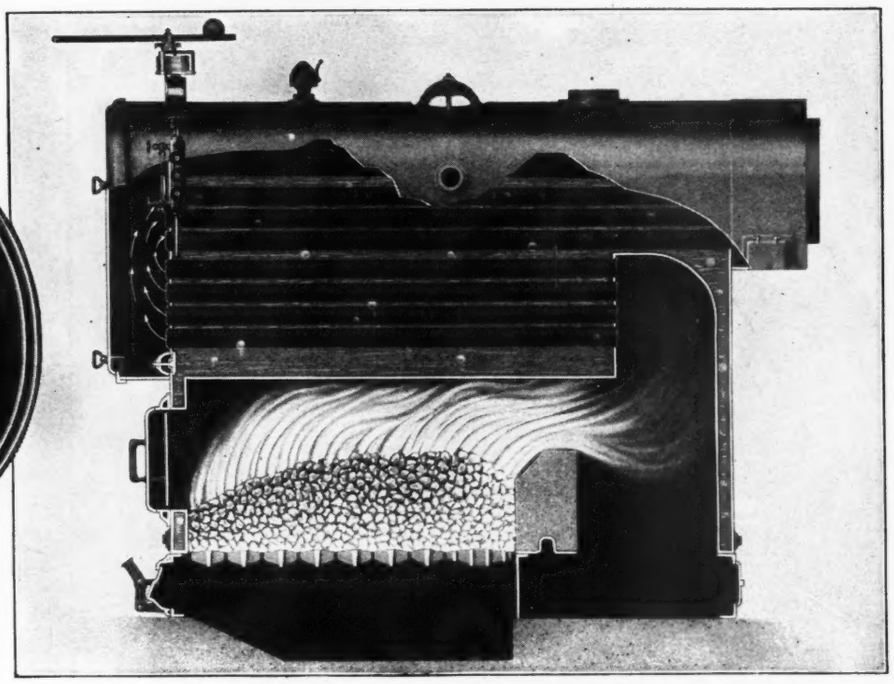
NEW HAVEN	PHILADELPHIA	DETROIT	INDIANAPOLIS	MINNEAPOLIS	OMAHA	SPOKANE	TORONTO
	SCRANTON	CLEVELAND	CHICAGO	ST. LOUIS	KANSAS CITY	PORTLAND	

HEGGIE-SIMPLEX

ELECTRIC-WELDED STEEL BOILERS



JAMES G. HEGGIE
who in 1892 founded the Heggie Organization and today is President of the Heggie-Simplex Boiler Co.



Heating Boiler Design Culminates in "Heggie-Simplex"

IN Heggie's 34 years of boiler manufacturing, boiler design has undergone an evolution, advancing from that of the early, cumbersome types up to the perfected "Heggie-Simplex" self-contained unit.

The "Heggie-Simplex" is the most modern heating boiler of today. Every feature has a scientific reason and furnishes definite advantages. It embodies all the desirable points which earlier types partially afforded, without any of their drawbacks. It provides the essentials necessary to the economical production of heat—in a boiler of the utmost simplicity.

The "Heggie-Simplex" is not only the ultimate in design but "The Quality Boiler of the Market" as well. Made of the finest materials money can buy, fabricated with painstaking care—built as you would expect of "Heggie."

HEGGIE-SIMPLEX BOILER COMPANY, Joliet, Illinois

Heating Boiler Division of James G. Heggie & Sons, Inc.

Representatives in

Akron, Albany, Albuquerque, Amarillo, Atlanta, Baltimore, Birmingham, Boston, Bradenton, Fla., Bristol, Va., Buffalo, Casper, Charleston, S. C., Chattanooga, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Davenport, Ia., Dayton, Daytona, Denver, Des Moines, Detroit, Duluth, Dunedin, Fla., El Paso, Evansville, Ind., Fort Wayne, Harrisburg, Houston, Indianapolis, Jacksonville, Joliet, Kan. City, Mo., La Crosse, Wis., Lakeland, Lima, O., Little Rock, Louisville

ELECTRIC-WELDED HEGGIE-SIMPLEX STEEL BOILERS

Representatives in

Lubbock, Lynchburg, Va., Memphis, Miami, Milwaukee, Minneapolis, Nashville, New Haven, New Orleans, Newport News, New York, Okla. City, Omaha, Orlando, Peoria, Ill., Philadelphia, Pittsburgh, Racine, Wis., Raleigh, Roanoke, Rochester, Rockford, San Antonio, Savannah, Scranton, Sebring, Fla., Shreveport, Spartanburg, Springfield, O., St. Louis, St. Petersburg, Syracuse, Tampa, Toledo, Tomahawk, Wis., Tulsa, Youngstown, O., W. Palm Beach, Washington, D.C., Waterloo, Ia., Winston-Salem

Just look up "Heggie-Simplex Boiler Co." in the phone book in any of the above cities for representative's number and address

The Heating and Ventilating Magazine

VOL. XXIII

Reg. U. S. Pat. Off.
Reg. Canadian Pat. and Copr't Off.

No. 9

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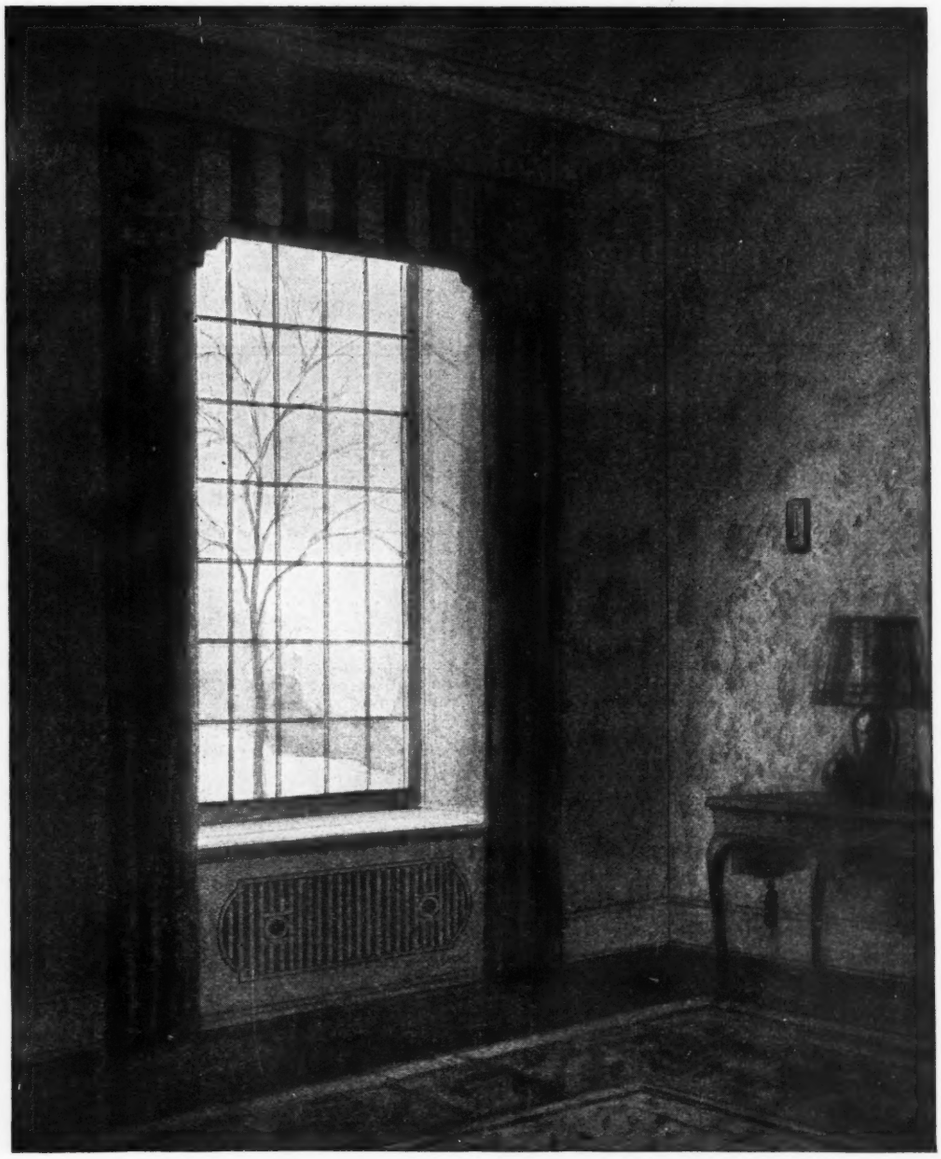

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